Although the words "he," "him," and "his" are used sparingly in this manual to enhance communication, they are not intended to be gender driven nor to affront or discriminate against anyone reading *Aircrew Survival Equipmentman 3 & 2, Volume 2*, NAVEDTRA 10329.

Naval Education And Training Program Development Center

AIRCREW SURVIVAL EQUIPMENTMAN 3&2, VOLUME 2

NAVEDTRA 10329

DEPARTMENT OF THE NAVY ★ CHIEF OF NAVAL EDUC AND TNG ★

1983 Edition Prepared by
PRC Vernon L. Rising and PRCM Paul Quinlan

PREFACE

This Rate Training Manual and Nonresident Career Course (RTM/NRCC) is the second of two volumes which form a self-study package that enables ambitious Aircrew Survival Equipmentmen to help themselves fulfill the requirements of their rating. Designed for individual study and not formal classroom instruction, the RTM provides subject matter that relates directly to the occupational standards for the PR3 and PR2. The NRCC provides the usual method for satisfying the requirement for completing the RTM. The set of assignments in the NRCC includes learning objectives and supporting items designed to lead students through the RTM. The occupational standards used as minimum guidelines in the preparation of this manual are found in the *Manual of Navy Enlisted Manpower and Personnel Classifications and Occupational Standards*, NAVPERS 18068-D.

Volume 1 introduces the aircrew survival equipmentman rating and describes sewing and fabrication, aviators personal survival clothing and equipment, helo rescue devices and carbon dioxide recharging equipment. *Aircrew Survival Equipmentman 3 & 2, Volume 2*, NAVEDTRA 10329 describes administration procedures, parachutes and associated components, liferafts and preservers, the rigid seat survival kit, and aviator's breathing oxygen systems. When complete, these two volumes will replace *Aircrew Survival Equipmentman 3 & 2*, NAVEDTRA 10358E.

This Rate Training Manual and Nonresident Career Course were prepared by the Naval Education and Training Program Development Center, Pensacola, Florida, for the Chief of Naval Education and Training.

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THE UNITED STATES NAVY

GUARDIAN OF OUR COUNTRY

The United States Navy is responsible for maintaining control of the sea and is a ready force on watch at home and overseas, capable of strong action to preserve the peace or of instant offensive action to win in war.

It is upon the maintenance of this control that our country's glorious future depends; the United States Navy exists to make it so.

WE SERVE WITH HONOR

Tradition, valor, and victory are the Navy's heritage from the past. To these may be added dedication, discipline, and vigilance as the watchwords of the present and the future.

At home or on distant stations we serve with pride, confident in the respect of our country, our shipmates, and our families.

Our responsibilities sober us; our adversities strengthen us.

Service to God and Country is our special privilege. We serve with honor.

THE FUTURE OF THE NAVY

The Navy will always employ new weapons, new techniques, and greater power to protect and defend the United States on the sea, under the sea, and in the air.

Now and in the future, control of the sea gives the United States her greatest advantage for the maintenance of peace and for victory in war.

Mobility, surprise, dispersal, and offensive power are the keynotes of the new Navy. The roots of the Navy lie in a strong belief in the future, in continued dedication to our tasks, and in reflection on our heritage from the past.

Never have our opportunities and our responsibilities been greater.

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CHAPTER 1

ADMINISTRATION

(PUBLICATIONS, FORMS, DIRECTIVES, AND DOCUMENTS)

As you advance in rate you will find that your responsibilities increase. As a PRAN and a PR3, you are assigned to jobs that require you to repack parachutes, operate sewing machines, clean oxygen masks, and perform similar tasks. Later, as a PR2, you may be a shop supervisor. As a supervisor you should have a full knowledge of technical publications.

When using any publication, you must be sure that you are using one which is up-to-date and contains all of the latest changes. This requires that you know where the publications come from and how they are kept up-to-date.

The primary purpose of technical publications is to aid mechanics and technicians. These publications communicate information that helps you do your job and instructions that you are required to follow. Some are prepared by the manufacturer of the specific model aircraft, engine, or equipment; others by the Naval Air Systems Command (NAVAIRSYSCOM) or by its field activities. Most of the publications you will use are prepared in accordance with specifications issued by NAVAIRSYSCOM. They set forth current authoritative information concerned with material upkeep, check, test, repair, and operation; and are intended to ensure optimum product performance. Since these publications express the orders and knowledge of the highest authorities, all personnel responsible for the operation and maintenance of aircraft, engines, and associated equipment and systems must be thoroughly familiar with, and use them.

Most technical publications of interest to you in the PR ratings are issued by NAVAIRSYSCOM. These publications are known as aeronautic publications and are grouped into two major classes or groups—MANUAL- and LETTER-TYPE PUBLICATIONS.

At one time all manual and other type publications were printed on paper and either were kept in folders or bound in books. Modern techniques permit these documents to be photographically reduced and stored on microfilm or microfilm cards called microfiche. To read the documents, you place the film or fiche in a reader which enlarges them. Some types of readers will photographically reproduce a full-size hard copy for your use.

MANUAL-TYPE PUBLICATIONS

Manuals are published in a book form and cover a number of subjects. Those of special interest to the Aircrew Survival Equipmentman (PR) are the 00 series (general manuals), the 03 series (accessories), and the 13 series (aircrew system manuals). Table 1-1 shows the classifications system for NAVAIR manuals.

NAVAL AERONAUTIC PUBLICATIONS INDEX

In order to find a listing of the publications available, you must be familiar with the following four parts of the *Naval Aeronautic Publications Index*:

1. *Equipment Applicability List*, NAVAIR 00-500A
2. *Aircraft Application List*, NAVAIR 00-500B
3. *Directives Application List*, NAVAIR 00-500C
4. *Microfilm Cartridge Cross-Reference*, NAVAIR 00-500M

Table 1-1.—General subject classification numbers for NAVAIR manual type publications

General	00
Aircraft	01
Powerplants (02A Reciprocating engines, 02B Jet engines, 02F Rocket engines)	02
Accessories	03
Hardware and Rubber Material	04
Instruments	05
Fuels, Lubricants, and Gases	06
Dopes and Paints	07
Electronics	08 & 16
Instructional Equipment and Training Aids	09 & 28
Photography	10
Aviation Armament	11
Fuel and Oil Handling Equipment	12
Parachute and Personal Survival Equipment	13
Hangars and Flying Field Equipment	14
Standard Preservation and Packaging Instructions	15
Machinery, Tool, and Test Equipment	17 & 18
Ground Servicing and Automotive Equipment	19
Descriptive Data Sheets for Aviation Support Equipment	20
Chemical Equipment	24 & 39
Meteorology	50
Ship Installations	51

NAVAIR 00-500A, Equipment Applicability List

NAVAIR 00-500A is a list of Naval Air Systems Command publications for aircraft (a/c) components and related equipment. It is cross-referenced according to model, type, or part number. You use the 00-500A to determine the publications that are available on a particular item of equipment. This list is published only in microfiche form.

NAVAIR 00-500B, Aircraft Application List

NAVAIR 00-500B is a list of manuals and of Maintenance Information Automated Retrieval System (MIARS) microfilm cartridges, organized according to their application to an aircraft. The *Aircraft Application List* is especially useful when you need to know what manuals and MIARS cartridges are available for a particular model aircraft.

NAVAIR 00-500C, Directives Application List

NAVAIR 00-500C lists the current NAVAIR letter-type technical directives (bulletins and changes) with respect to their applicability to an aircraft. It serves the same purpose for the letter-type technical directives as the *Aircraft Application List* does for technical manuals.

NAVAIR 00-500M, Microfilm Cartridge Cross-Reference

The Microfilm Cartridge Cross-Reference, NAVAIR 00-500M, is arranged in three parts. Part I, NAVAIR 00-500M.1, contains a list of NAVAIRSYSCOM technical manuals cross-referenced to microfilm cartridge numbers with their current dates, and Part II is a list of Maintenance Information Automated Retrieval System (MIARS) cartridge numbers and their latest film dates.

Part III, NAVAIR 00-500M.2, is a listing of MIARS cartridges and their applicable technical manuals organized according to aircraft model. The MIARS cartridges are listed in cartridge number sequence within the aircraft series. Only those technical manuals applicable to the aircraft are listed.

NAVSUP 2002, NAVY STOCK LIST OF PUBLICATIONS AND FORMS

Listings of aeronautic publications originated by NAVAIRSYSCOM and distributed by Naval Air Technical Services Facility (NATSF) are found in the *Navy Stock List of Publications and Forms*, NAVSUP Publication 2002. This list supplements the *Naval Aeronautic Publications Index* (NAPI).

ACCESSORIES MANUALS (03 SERIES)

The 03 series manuals cover all types of accessories. An accessory is defined as any item of equipment which is required for operation of the aircraft but which cannot be considered an integral part of the airframe or engine.

The manufacturer of each item of equipment (valves, pumps, fuel controls, etc.) is required to provide adequate instructions for the operation of the item and for the maintenance of it throughout its service life. Accessories manuals, therefore, contain descriptive data; detailed instructions for installation, operation, inspection, maintenance, overhaul, and an illustrated parts breakdown. All available accessories manuals are listed in numerical order (by publication number) in the NAVSUP Publication 2002. They are also listed in NAVAIR 00-500A, but according to part number. In NAVAIR 00-500B, accessories manuals are listed under the aircraft in which the accessory is installed.

Accessories manuals are used to supplement information in aircraft maintenance instructions manuals. For example, when the *Maintenance Instructions Manual* does not provide instructions for repairing a particular item, you will find them in the applicable accessories manual.

To determine what manuals are available for a particular accessory, you proceed as follows:

If the model, type, or part number is known, use the NAVAIR 00-500A and locate the item in the alphanumerical listing. All manuals for that particular item of equipment will be listed by code number, publication number, and stock number. Using these numbers, you will find the complete title of the available manuals in the NAVSUP Publication 2002.

AVIATION CREW SYSTEMS MANUALS, NAVAIR 13-1-6

This series of manuals also includes information of interest to you. These manuals cover all the technical information that pertains to the PR rate. The *Aviation Crew Systems Manual*, commonly called the "Aircrew Systems Manual", is released under the authority of the Naval Air Systems Command. It is mandatory that you follow the instructions contained in the six separate volumes of the manual.

Instructions in the NAVAIR 13-1-6 series manuals may permit an operating activity, with approval of the controlling custodian, to conditionally modify ONE unit of equipment in-service to correct or overcome unsatisfactory conditions in that equipment item. Any type of deviation, peculiar configuration, or modification of life support and survival equipment not authorized by these publications is disallowed and the fleet riggers have no authority or responsibility to perform them. Unauthorized modification of, and deviations from the designed configuration of prescribed life support and survival equipment could create unknown safety hazards.

The *Naval Aviation Maintenance Program Manual*, OPNAVINST 4790.2 (Series), identifies NAVAIRSYSCOM as the only authority for modification to life support equipment and survival equipment. NAVAIR usually orders the cognizant field activity to perform such modifications by publishing a change to the Aircrew Systems Manual.

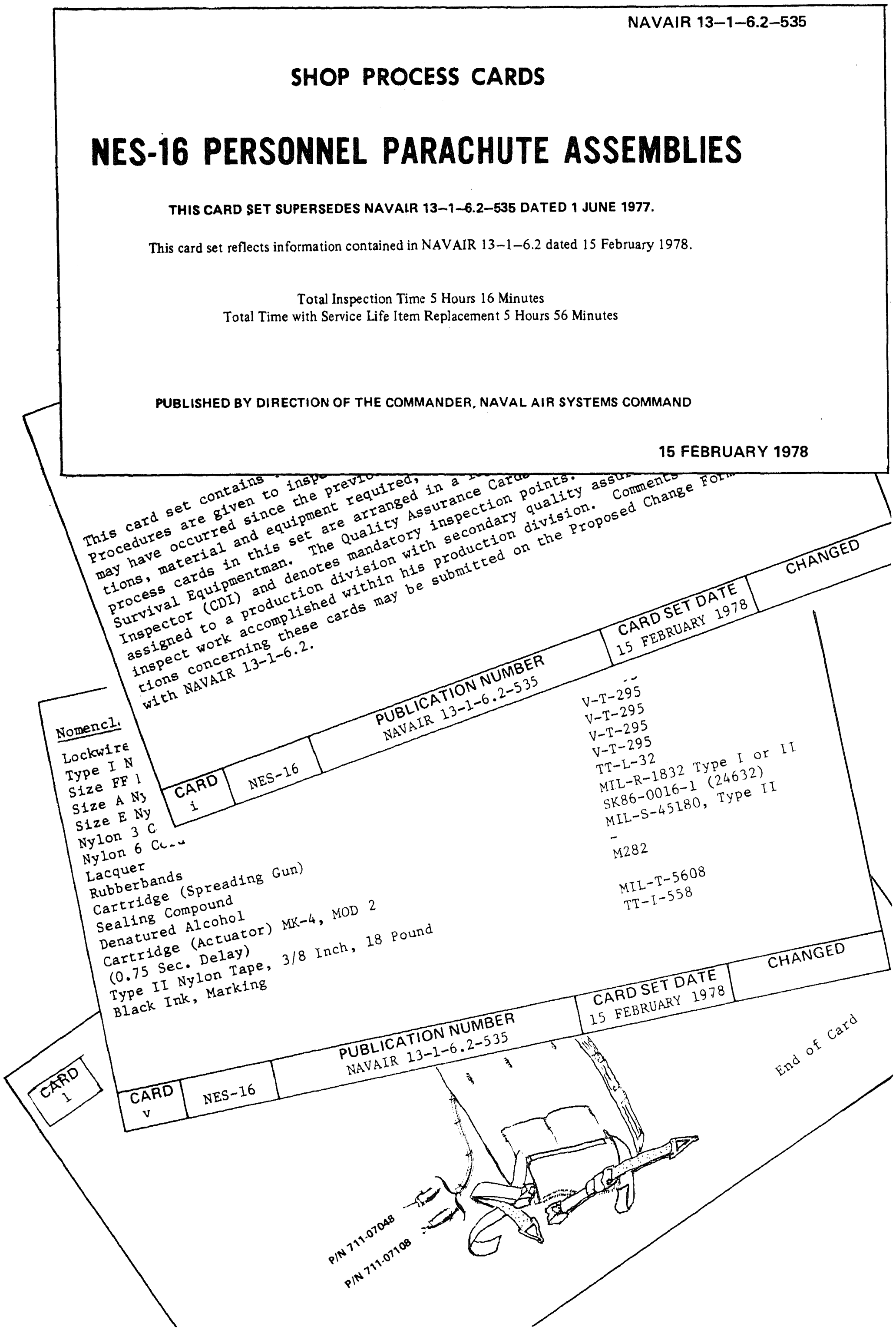
The NAVAIR 13-1-6 manual consists of six separate bound volumes, as follows:

TITLE	PUBLICATION NUMBER
1. Inflatable Survival Equipment	NAVAIR 13-1-6.1
2. Parachutes	NAVAIR 13-1-6.2
3. Seat Survival Kits	NAVAIR 13-1-6.3
4. Oxygen Equipment	NAVAIR 13-1-6.4
5. Rescue and Survival Equipment	NAVAIR 13-1-6.5
6. Aircrew Personal Protective Equipment	NAVAIR 13-1-6.7

Each volume provides you with needed technical information related to the configuration, application, function, inspection, and repair of a particular category of aircrew safety and survival equipment. The information contained in each volume is used by organizational, intermediate, and depot level maintenance activities as directed by the *Naval Aviation Maintenance Program Manual*, OPNAVINST 4790.2 (Series).

Conflicts with Manuals

The six volumes that make up the NAVAIR 13-1-6 series take precedence (authority) over all other documents except the Aircrew System Changes, Interim Aircrew System Changes, and Aircrew System Bulletins. A change, as used here, is a document containing instructions and information which directs the accomplishment and recording of a material change such as a repositioning, modification, or alteration to the equipment to which it applies. Bulletins, as used here, are message-type documents containing



NAVAIR 13–1–6.2–535

SHOP PROCESS CARDS

NES-16 PERSONNEL PARACHUTE ASSEMBLIES

THIS CARD SET SUPERSEDES NAVAIR 13–1–6.2–535 DATED 1 JUNE 1977.

This card set reflects information contained in NAVAIR 13–1–6.2 dated 15 February 1978.

Total Inspection Time 5 Hours 16 Minutes
Total Time with Service Life Item Replacement 5 Hours 56 Minutes

PUBLISHED BY DIRECTION OF THE COMMANDER, NAVAL AIR SYSTEMS COMMAND

15 FEBRUARY 1978

This card set contains
Procedures are given to insp
may have occurred since the previ
tions, material and equipment required,
process cards in this set are arranged in a
Survival Equipmentman. The Quality Assurance Card
Inspector (CDI) and denotes mandatory inspection points.
assigned to a production division with secondary quality assu
inspect work accomplished within his production division. Comments
tions concerning these cards may be submitted on the Proposed Change For
with NAVAIR 13-1-6.2.

CARD i | NES-16 | PUBLICATION NUMBER NAVAIR 13-1-6.2-535 | CARD SET DATE 15 FEBRUARY 1978 | CHANGED

Nomencl
Lockwire
Type I N
Size FF 1
Size A Ny
Size E Ny
Nylon 3 C
Nylon 6 C
Lacquer
Rubberbands
Cartridge (Spreading Gun)
Sealing Compound
Denatured Alcohol
Cartridge (Actuator) MK-4, MOD 2
(0.75 Sec. Delay)
Type II Nylon Tape, 3/8 Inch, 18 Pound
Black Ink, Marking

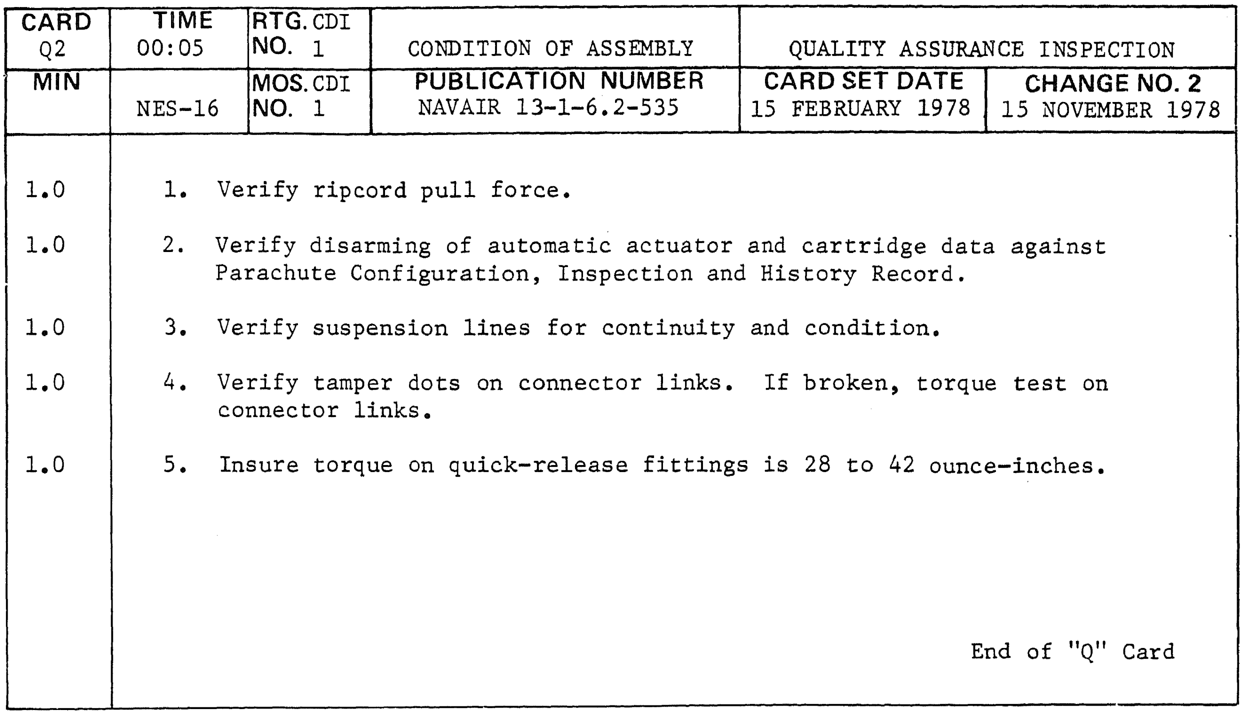
V-T-295
V-T-295
V-T-295
V-T-295
TT-L-32
MIL-R-1832 Type I or II
SK86-0016-1 (24632)
MIL-S-45180, Type II
M282
MIL-T-5608
TT-I-558

CARD v | NES-16 | PUBLICATION NUMBER NAVAIR 13-1-6.2-535 | CARD SET DATE 15 FEBRUARY 1978 | CHANGED

End of Card

CARD 1

Figure 1-1.—Shop process card.



CARD Q2	TIME 00:05	RTG. CDI NO. 1	CONDITION OF ASSEMBLY	QUALITY ASSURANCE INSPECTION	
MIN	NES-16	MOS. CDI NO. 1	PUBLICATION NUMBER NAVAIR 13-1-6.2-535	CARD SET DATE 15 FEBRUARY 1978	CHANGE NO. 2 15 NOVEMBER 1978

1.0	1. Verify ripcord pull force.
1.0	2. Verify disarming of automatic actuator and cartridge data against Parachute Configuration, Inspection and History Record.
1.0	3. Verify suspension lines for continuity and condition.
1.0	4. Verify tamper dots on connector links. If broken, torque test on connector links.
1.0	5. Insure torque on quick-release fittings is 28 to 42 ounce-inches.
	End of "Q" Card

Figure 1-2.—Shop process "Q" card.

instructions and information which direct one-time inspections to determine whether a given condition exists. They also specify what action is to be taken if the condition is found. They may contain instructions for corrective action provided no change in material or configuration is involved in the action. Changes and bulletins are used to keep survival equipment up-to-date without making major changes to the NAVAIR 13-1-6 Manual. Current, effective changes and bulletins which affect survival equipment should be filed within the subject chapter of the *Aviation Crew Systems Manual.*

Updating

When the *Aviation Crew Systems Manual* is updated, all changes and bulletins are incorporated (brought into) in the appropriate chapters. A volume may be updated by a revision, which is a 100 percent replacement of the book. Between revisions, rapid action changes which are replacement pages are released. Rapid action changes to the manual must be entered as received in order for you to have an up-to-date set of manuals within your work center.

In addition to the six volumes of the *Aviation Crew Systems Manuals*, you will find a set of Shop Process Cards (SPC) for each piece of survival equipment listed within these manuals.

SHOP PROCESS CARDS (SPC)

So that you may follow the proper procedures, the guidelines for inspecting and packing parachute assemblies have been extracted from the authoritative manuals and placed on Shop Process Cards (SPC) as shown in figure 1-1. Sets of these SPCs are available for most types of parachutes in use. You will have the applicable set of cards at hand as you make a maintenance inspection. On the cards you will find descriptions and illustrations of the step-by-step procedures you are to follow, and the necessary technical data such as clearances, torque values, and tolerances. With the correct, up-to-date set of cards, you will find no need for guess-work when working on survival equipment.

With the shop process cards that you use to perform a maintenance inspection you have other cards—Quality Assurance Cards, or "Q" Cards (see figure 1-2). These are used by a designated

Collateral Duty Inspector (CDI) who checks your work at designated points in the inspection and repacking procedure. These CDIs are permanently assigned to regularly work in a production division with secondary quality assurance assignments to inspect work accomplished by other personnel within the division.

As you read through the shop process cards, you need to know the definitions and abbreviations that are common to all shop process cards.

Definitions:

Note—An information item. The note may precede or follow the item to which it refers.

Caution—Indicates danger to the equipment. The caution precedes the item to which it refers.

Warning—Indicates danger to personnel. The warning precedes the item to which it refers.

Examine—To inspect closely and to test the condition of an item.

Damage—A harmful condition caused by an abnormal force or object.

Ensure—Make certain necessary measures have been taken.

Security—An item firmly, positively, and safely attached in the authorized manner.

Proper—Correct or authorized configuration or method.

Abbreviations:

MK—Mark
MOD—Model
CDI—Collateral Duty Inspector
PR—Aircrew Survival Equipmentman
IMP—Impulse

SAFETY PRECAUTIONS MANUAL NAVMAT P-5100 (Series)

The safety precautions contained in this manual are applicable to all Navy personnel, military and civilian, and to all naval commands and activities. There are two safety manuals that you should be familiar with—NAVMAT P-5100, which covers shore activities, and OPNAV INSTRUCTION 5100.19, which covers shipboard activities.

The precautions are basic and general in nature and cannot cover every operation and function involved in the great variety of Navy activities. In many instances, references are made to other publications for detailed precautions for specific conditions. If a hazard and its applicable precautions are not included in this manual, it does not mean that the hazard does not exist or should not be taken seriously. The cooperation and vigilance of all personnel are needed to see that ALL operating procedures and work methods are safe and so as not to unnecessarily expose personnel to injury or property to loss or damage.

Safety precautions should be posted in a conspicuous place on, at, or near any equipment, component, or material which presents a hazard. For example, those precautions necessary for the safe handling, stowage, and security of dangerous materials such as explosives or flammables are posted at or near the storage spaces designated for those materials. You and your co-workers are responsible for knowing, understanding, and observing all safety precautions applicable to your work and your work area.

All chapters of the safety precautions manuals are extremely important, and you as a PR should be especially concerned with the chapter entitled "Aviation." This chapter covers general precautions applicable to the maintenance, repair, and overhaul of aircraft.

ALLOWANCE LISTS AND OUTFITTING LISTS, 00-35Q (Series)

Allowance Lists and Outfitting Lists are lists of the equipment and material necessary for the full operating capability of Navy activities. These allowances are based on known or estimated requirements or on available usage data.

Allowance Lists are identified by SECTIONS. Certain sections such as A, H, and K are individual publications. Others such as B and R appear as a series of publications, each of which is applicable to a specific model of equipment, model of aircraft, or type of activity.

You, as a PR, should be familiar with Section A, *Standard Aeronautical and Navy Stock Account Material*, and with the allowance list designated NA 00-35QH-2, and commonly referred to as QH-2.

The QH-2 is the Allowance List (AL) that contains flight operational material such as flight clothing. This is the material that your rating works with. It applies to all carrier air wings and to all Navy and Marine Corps squadrons and other activities operating aircraft or having aircraft assigned. The material contained in this AL is furnished to units for initial outfitting and becomes organizational property of the units.

This AL has an alphabetic index and four different parts. Part 1 contains aircraft flight materials which include clothing, survival, and flotation equipment; oxygen and anti-G equipment; and aircrew flight material. Part 2 contains anti-exposure equipment and winter flight gear. Part 3 contains protective equipment for aircraft maintenance personnel. Part 4 lists protective hearing equipment and accessories for flight crews and aircraft maintenance personnel.

In addition, appendix 1 in the back of the QH-2, indicates the number of pilot and nonpilot crewmembers per type of aircraft. It also indicates the number of liferafts and parachutes allowed for each type of aircraft.

The QH-2 does not contain a part number index or NSN index. Its only index is arranged alphabetically by noun name.

LETTER-TYPE PUBLICATIONS

The *Navy Stock List of Publications and Forms*, NAVSUP Publication 2002, contains a list of all letter-type publications and forms in the Naval Publications and Forms Center (NPFC) inventory. This publication is very extensive, but is issued on microfiche, so it does not require much space. The list includes all technical publications and forms issued by the major bureaus, offices, and systems commands, (OPNAV, NAVPERS, NAVAIRSYSCOM, NAVSEASYSCOM, etc.). These publications include technical directives, instructions, and notices.

TECHNICAL DIRECTIVES

The Technical Directives (TDs) system is issued to direct the accomplishment of modifications and one-time inspections of NAVAIR accepted equipment either in the contractor's or Navy's possession and to record the performance of these operations. These instructions apply to all equipment NAVAIR is responsible for.

The policy of NAVAIR requires that equipment be maintained so as to provide maximum safety, operation, and material readiness. The TD system, as part of the NAMP and configuration management program outlined in NAVMATINST 4130.1 (Series), is an important element in carrying out this policy.

Types of Technical Directives

Technical Directives (TD) are issued either as formal letter-type or message-type directives. A formal TD may order a change, an amendment, or a revision of equipment and is issued by letter. A message-type TD document may be an information bulletin or an order for an interim change, amendment, or revision of equipment and is issued by message to ensure prompt distribution and action.

Message-Type Technical Directives.—Message-type technical directives are used to direct the accomplishment and recording of modifications and one-time inspections of NAVAIR accepted equipment.

Rapid-Action Minor Engineering Change (RAMEC).—A RAMEC is a message-type technical directive which provides for expeditious action on minor changes to equipment which offer significant advantages to the operating forces.

Letter-Type Technical Directives.—It is the policy of NAVAIR to issue formal (letter-type) technical directives to modify service equipments; however, when it will take too long to issue a formal technical directive, an interim change may be issued. All interim changes (except RAMECs which are not normally formalized) shall be superseded within 180 days by a formal technical directive of the same title, number, and subject. NAVAIR (AIR-04) is responsible for issuing the formal technical directives for the equipment you will work on.

Methods of Updating Technical Directives

AMENDMENTS.—An amendment is a document comprised of information which clarifies, corrects, adds to, deletes, makes minor changes in requirements to, or cancels an existing TD. A maximum of three amendments may be applied to any TD, each remaining in effect until rescinded or superseded by a revision. An amendment may not be used to cancel another amendment.

REVISIONS.—A revision is a completely new edition of an existing change or bulletin. It shall supersede the original directive or revision and all existing amendments.

RECISION/CANCELLATION.—Recision is the process by which TDs are removed from active files after all the actions they require have been completed. Final recision action is directed in the TD index, NAVSUP Publication 2002. Your technical libraries shall maintain all documents applicable to your equipment until the TD is deleted from the TD index, NAVSUP 2002.

Cancellation is the process by which TDs are removed from active files. When it is decided that the action it orders is not to be performed or continued, cancellation action is directed by issuance of an amendment to the TD. The cancellation amendment shall state explicitly the required configuration of each article initially specified for modification—for instance, whether installed modifications are to remain installed or are to be removed.

INSTRUCTIONS AND NOTICES

Instructions and notices are directives containing information and instructions concerning policy, administration, and operations. They are issued by all systems commands, ships, stations, and operating activities. Those issued by Naval Air Systems Command are known as NAVAIR instructions and notices.

Instructions and notices are identified by originator and subject classifications. There are 13 major subject classification groups (see table 1-2). These major series groups are further subdivided by the use of the last three digits in the major series.

Table 1-2.—General subject classification numbers for instructions and notices

1000 Series.	Military Personnel.
2000 Series.	Communications.
3000 Series.	Operations and Readiness.
4000 Series.	Logistics.
5000 Series.	General Administration and Management.
6000 Series.	Medicine and Surgery.
7000 Series.	Financial Management.
8000 Series.	Ordnance Material.
9000 Series.	Ships Design and Ships Material.
10000 Series.	General Material.
11000 Series.	Facilities and Activities Ashore.
12000 Series.	Civilian Personnel.
13000 Series.	Aeronautical and Astronautical Material.

These major subject groups are subdivided into primary, secondary, and sometimes tertiary breakdowns. Primary subjects are designated by the first one or two digits (the thousand group) of the code number, secondary subjects by the next two digits, and tertiary breakdown by the final digit. Take as an example the 5000 General Administration and Management—the first instructions issued on any of the subject group code numbers is 5XXX.1. For instance, the first Instruction issued by NAVAIRSYSCOM on the subject of directive issuance is 5215.1. Subsequent instructions issued on the same subject would be numbered in consecutive order; i.e., 5215.2, 5215.3, etc. When there is a substantial change in an instruction, it is rewritten and reissued, as a revision. Each revision is assigned the same subject classification number as the superseded instruction, and is further identified by a suffix capital letter; the first revision being A, the second B, etc.—5215.2A, for example.

Instructions are directives of a continuing nature and are effective until canceled or superseded by a later directive. Notices are directives of a one-time nature or directives which are applicable for a brief period of time. Each notice contains a statement describing when it is to be cancelled. For instance it may state: "This notice is cancelled when the required action is completed."

Because of their one-time nature or brief duration, instructions and notices are not assigned consecutive numbers. For this reason, the date must always be used when referring to a notice. Those instructions and notices pertaining to aviation maintenance may be addressed to "All Ships, Stations, and Units concerned with Navy Aircraft," or to certain activities only. Each activity maintains a file of all pertinent instructions and notices still in effect.

MAINTENANCE DOCUMENTATION

You must become familiar with the Support Action Form (SAF), OPNAV 4790/42, and the Visual Information Display System/Maintenance Action Form (VIDS/MAF), OPNAV 4790/60. All completions of maintenance actions to a repairable item are documented on these forms. Maintenance actions include troubleshooting, removal, replacement, repair, the performance of scheduled inspections, and technical directive compliance.

VISUAL INFORMATION DISPLAY SYSTEM MAINTENANCE ACTION FORM (VIDS/MAF)

The VIDS/MAF is a five-part form (refer to figure 1-3) which is used primarily by the organizational and intermediate level maintenance activities. Figures 1-3 and 1-4 are samples of five-part VIDS/MAFs. You will find that as your rate increases your knowledge of the VIDS/MAF also increases. We cover the different blocks of the five-part VIDS/MAF to show you how to properly complete the form. Figure 1-3 shows the form being used for tool inventory.

Entries Required Signature Block

This section ensures that historical records are updated in a timely and orderly manner. When a maintenance action requires information to be entered in the Historical record, the entry shall be made prior to forwarding the VIDS/MAF to Data Services for keypunching. Maintenance Control/Logs and Records personnel screen all VIDS/MAFs and place an (x) in appropriate blocks to indicate if log and/or SPC card entries are required. To certify that necessary entries have been made, the person making entries in these records enters his name and rate in the signature portion of the block.

Reference/Local Use Block

In this block you enter the supply reference to aid the Material Control Division in ordering required material. This block may also be used locally as desired. For instance, as illustrated in figure 1-3, the toolbox inventory is entered in this block on the same line corresponding to the worker listed in the Accumulated Work Hours block. When the task is completed and the tools are returned to the work center, a sight inventory of them is conducted by the Work Center Supervisor or CDI who then initials to the left of the toolbox number. When more than one toolbox is used, the workers having toolboxes on the job place the toolbox number to the left of their names and the person conducting the sight inventory initials the form to the left of the box numbers.

Accumulated Work Hours Block (See Figure 1-4)

(a) Name/Shift—Enter the name or shift of the personnel doing the work.

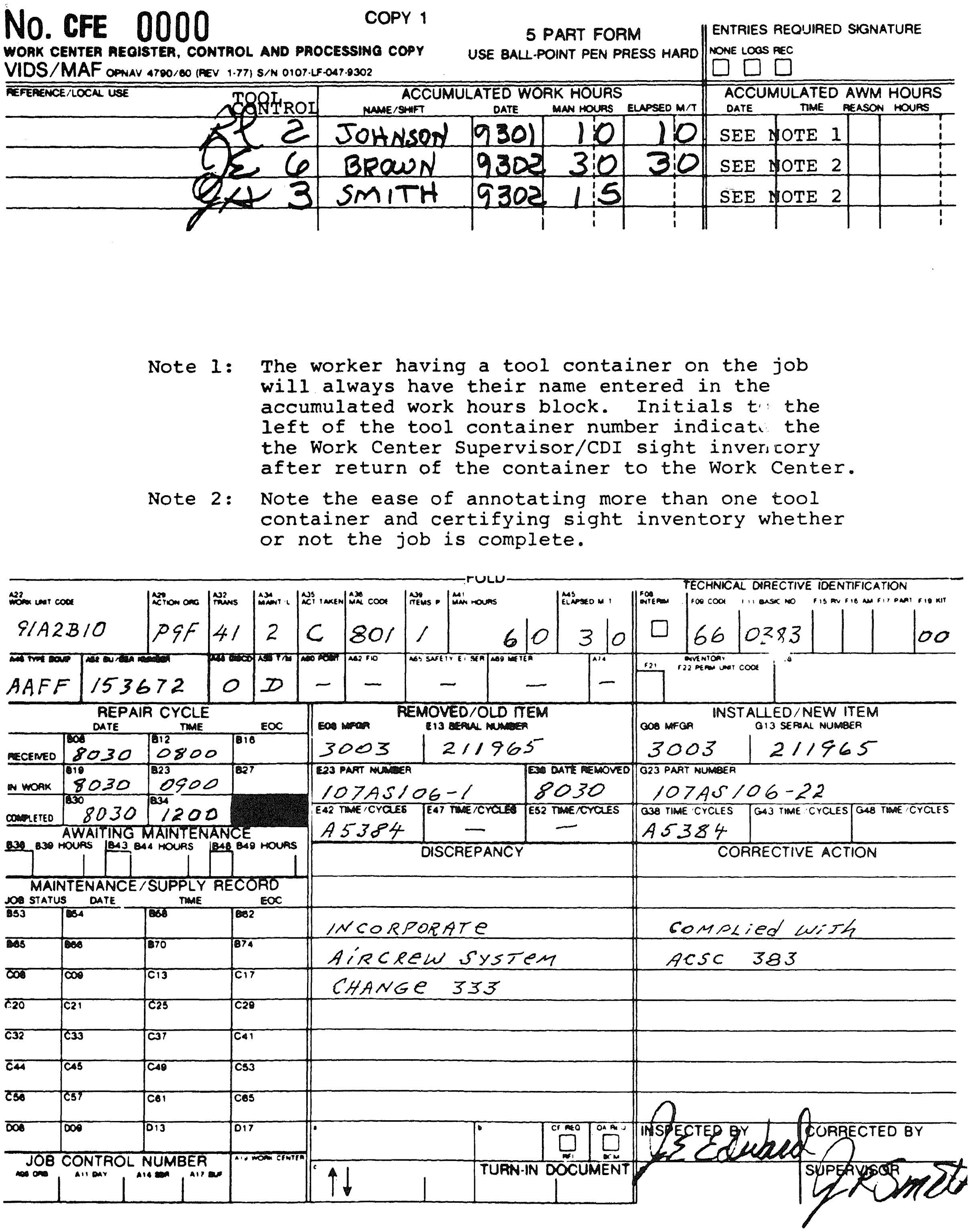
(b) Date—Enter the Julian date on which the action takes place.

(c) Man-hours—Enter the number of man-hours that were expended to correct the problem (in hours and tenths).

(d) EMT (Elapsed Maintenance Time)—Enter the number of clock hours involved in making the repair (in hours and tenths). For example, if three men worked together for 2.5 hours to make a repair, the total man-hours would be 7.5 hours and the EMT would be 2.5 hours.

Accumulated AWM (Awaiting Maintenance) Hours Block

This block may be used as a scratch pad to record awaiting maintenance hours accumulated against a job. Record the beginning date and time of the AWM period with the proper AWM reason code. At the end of the AWM period, you should



No. CFE 0000 COPY 1

WORK CENTER REGISTER, CONTROL AND PROCESSING COPY

VIDS/MAF OPNAV 4790/60 (REV 1-77) S/N 0107-LF-047-9302

5 PART FORM

USE BALL-POINT PEN PRESS HARD

ENTRIES REQUIRED SIGNATURE

NONE ☐ LOGS ☐ REC ☐

REFERENCE/LOCAL USE	TOOL CONTROL	ACCUMULATED WORK HOURS NAME/SHIFT	DATE	MAN HOURS	ELAPSED M/T	ACCUMULATED AWM HOURS DATE	TIME	REASON	HOURS
	2	JOHNSON	9301	1 0	1 0	SEE NOTE 1			
	6	BROWN	9302	3 0	3 0	SEE NOTE 2			
	3	SMITH	9302	1 5		SEE NOTE 2			

Note 1: The worker having a tool container on the job will always have their name entered in the accumulated work hours block. Initials to the left of the tool container number indicate the the Work Center Supervisor/CDI sight inventory after return of the container to the Work Center.

Note 2: Note the ease of annotating more than one tool container and certifying sight inventory whether or not the job is complete.

FOLD

TECHNICAL DIRECTIVE IDENTIFICATION

A22 WORK UNIT CODE	A29 ACTION ORG	A32 TRANS	A34 MAINT L	A35 ACT TAKEN	A36 MAL CODE	A39 ITEMS P	A41 MAN HOURS	A45 ELAPSED M/T	F08 INTERIM	F09 CODE	F11 BASIC NO	F15 RV	F16 AM	F17 PART	F19 KIT
91A2B10	P9F	41	2	C	801	1	6 0	3 0	☐	66	0383				00

A46 TYPE EQUIP	A52 BU/SER NUMBER	A56 DISCD	A58 T/M	A60 POSIT	A62 FID	A65 SAFETY EI SER	A69 METER	A74	F21	INVENTORY F22 PERM UNIT CODE
AAFF	153672	0	D	—	—	—	—	—		

REPAIR CYCLE

	DATE	TIME	EOC
RECEIVED	B08 8030	B12 0800	B16
IN WORK	B19 8030	B23 0900	B27
COMPLETED	B30 8030	B34 1200	

AWAITING MAINTENANCE

B38 B39 HOURS B43 B44 HOURS B48 B49 HOURS

REMOVED/OLD ITEM

E08 MFGR	E13 SERIAL NUMBER		
3003	211965		
E23 PART NUMBER		E38 DATE REMOVED	
107AS106-1		8030	
E42 TIME/CYCLES	E47 TIME/CYCLES	E52 TIME/CYCLES	
A5384	—	—	

INSTALLED/NEW ITEM

G08 MFGR	G13 SERIAL NUMBER	
3003	211965	
G23 PART NUMBER		
107AS106-22		
G38 TIME/CYCLES	G43 TIME/CYCLES	G48 TIME/CYCLES
A5384		

MAINTENANCE/SUPPLY RECORD

JOB STATUS	DATE	TIME	EOC
B53	B54	B58	B62
B65	B66	B70	B74
C08	C09	C13	C17
C20	C21	C25	C29
C32	C33	C37	C41
C44	C45	C49	C53
C56	C57	C61	C65
D08	D09	D13	D17

DISCREPANCY	CORRECTIVE ACTION
INCORPORATE	COMPLIED WITH
AIRCREW SYSTEM	ACSC 383
CHANGE 333	

JOB CONTROL NUMBER

A08 ORG A11 DAY A14 SER A17 SUF

A19 WORK CENTER

CF REQ ☐ RFI

QA REQ ☐ BCM

↑↓

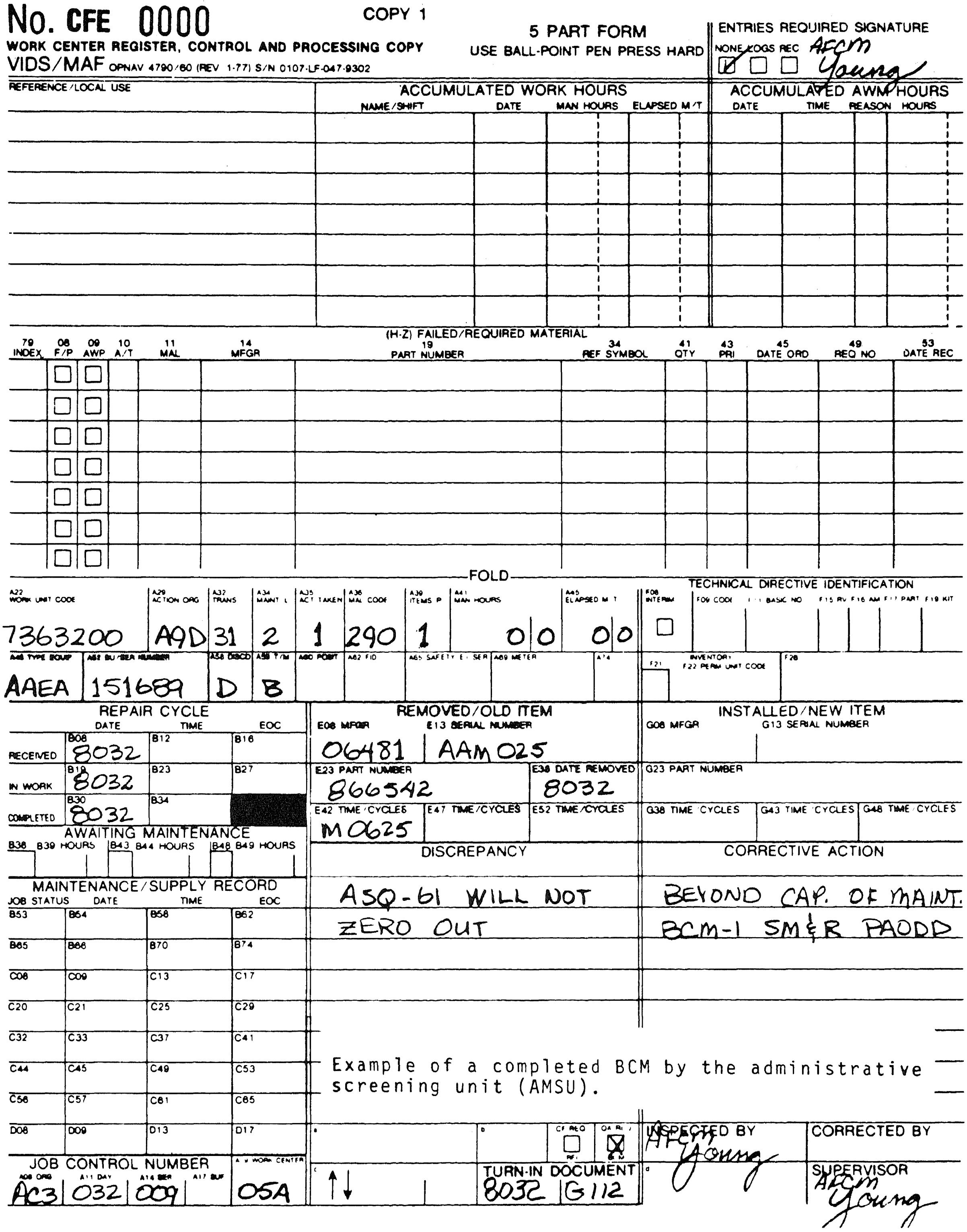
TURN-IN DOCUMENT

INSPECTED BY J E Edward

CORRECTED BY

SUPERVISOR J K Smit

Figure 1-3.—Tool control inventory.



No. CFE 0000 COPY 1

WORK CENTER REGISTER, CONTROL AND PROCESSING COPY

VIDS/MAF OPNAV 4790/60 (REV 1-77) S/N 0107-LF-047-9302

5 PART FORM

USE BALL-POINT PEN PRESS HARD

ENTRIES REQUIRED SIGNATURE

NONE ☑ LOGS ☐ REC ☐ AFCM Young

REFERENCE/LOCAL USE

ACCUMULATED WORK HOURS NAME/SHIFT	DATE	MAN HOURS	ELAPSED M/T	ACCUMULATED AWM HOURS DATE	TIME	REASON	HOURS

(H-Z) FAILED/REQUIRED MATERIAL

79 INDEX	08 F/P	09 AWP	10 A/T	11 MAL	14 MFGR	19 PART NUMBER	34 REF SYMBOL	41 QTY	43 PRI	45 DATE ORD	49 REQ NO	53 DATE REC
	☐	☐										
	☐	☐										
	☐	☐										
	☐	☐										
	☐	☐										
	☐	☐										
	☐	☐										

FOLD

A22 WORK UNIT CODE	A29 ACTION ORG	A32 TRANS	A34 MAINT L	A35 ACT TAKEN	A36 MAL CODE	A39 ITEMS P	A41 MAN HOURS	A45 ELAPSED M T	F08 INTERIM
7363200	A9D	31	2	1	290	1	0 0	0 0	☐

TECHNICAL DIRECTIVE IDENTIFICATION: F09 CODE | F11 BASIC NO | F15 RV | F16 AM | F17 PART | F19 KIT

A48 TYPE EQUIP	A52 BU/SER NUMBER	A58 DISCD	A59 T/M	A60 POSIT	A62 FID	A65 SAFETY E SER	A69 METER	A74
AAEA	151689	D	B					

F21 INVENTORY F22 PERM UNIT CODE | F28

REPAIR CYCLE

	DATE	TIME	EOC
RECEIVED	B08 8032	B12	B16
IN WORK	B19 8032	B23	B27
COMPLETED	B30 8032	B34	

AWAITING MAINTENANCE

B38 B39 HOURS | B43 B44 HOURS | B48 B49 HOURS

REMOVED/OLD ITEM

E08 MFGR: 06481

E13 SERIAL NUMBER: AAM025

E23 PART NUMBER: 866542

E38 DATE REMOVED: 8032

E42 TIME/CYCLES: M0625

E47 TIME/CYCLES

E52 TIME/CYCLES

INSTALLED/NEW ITEM

G08 MFGR | G13 SERIAL NUMBER

G23 PART NUMBER

G38 TIME CYCLES | G43 TIME CYCLES | G48 TIME CYCLES

DISCREPANCY

ASQ-61 WILL NOT

ZERO OUT

CORRECTIVE ACTION

BEYOND CAP. OF MAINT.

BCM-1 SM&R PAODD

MAINTENANCE/SUPPLY RECORD

JOB STATUS	DATE	TIME	EOC
B53	B64	B58	B62
B65	B66	B70	B74
C08	C09	C13	C17
C20	C21	C25	C29
C32	C33	C37	C41
C44	C45	C49	C53
C56	C57	C61	C65
D08	D09	D13	D17

Example of a completed BCM by the administrative screening unit (AMSU).

CF REQ ☐ QA RQ ☒

INSPECTED BY AFCM Young

CORRECTED BY

SUPERVISOR AFCM Young

JOB CONTROL NUMBER

A08 ORG	A11 DAY	A14 SER	A17 SUF	A21 WORK CENTER
AC3	032	009		05A

↑↓

TURN-IN DOCUMENT 8032 G112

Figure 1-4.—Completed VIDS/MAF BCM Action (AMSU).

compute the accumulated AWM hours and enter the result in the hours section of this block. AWM codes are listed in OPNAVINST 4790.2.

(H-Z) Failed/Required Material Block

This section is used to document failed parts and engine identification data.

Block A22—Work Unit Code

Enter the WUC that identifies the system, specific equipment, or component, or part on which work is being performed. In cases where removed repairable parts do not have a WUC assigned, you should use the five or seven character NOC (Not Otherwise Coded) code provided by the system or component.

Block A29—Action Organization

Enter the organization code of the activity accomplishing the work. The codes are found in OPNAVINST 4790.2 (Series).

Block A32—Trans (Transaction Code)

Enter on the document the transaction code describing the type of action accomplished. Transaction codes are listed in OPNAVINST 4790.2 (Series).

Block A34—Maint/L (Maintenance Level)

Enter the appropriate number (1, 2, or 3) describing the level of maintenance being performed (not necessarily the level assigned to the activity). For instance, number 1 indicates work of the sort done at the organizational level even if your activity is level 2 or an intermediate maintenance activity.

Block A35—Act Taken (Action Taken)

Enter the code that describes the action taken to correct the discrepancy. A consumable item replaced on a VIDS/MAF should reflect the system or next higher assembly code only in block A22 (Work Unit Code) and Action Taken Code C in block A35.

Block A36—MAL Code (Malfunction Description Code)

Enter the malfunction description code that best describes the trouble or cause of trouble in the system or component identified in the Work Unit Code block (A22). When a conditional malfunction code is used on the primary document, the same code is used on all related assisting VIDS/MAFs and suffixed VIDS/MAFs.

Block A39—Items/P (Items Processed)

Enter the number of times the action indicated in Block A35 (Action Taken) was taken against the item described in the work unit code Block A22 (except Action Taken N, L, and Look phase inspection documents).

Block A41—Man-hours

Enter the number of man-hours that were expended to correct the discrepancy (in hours and tenths).

Block A45—Elapsed M/T (Elapsed Maintenance Time)

Enter the number of clock hours involved in making the repair (in hours and tenths). For example, if three men worked together for 2.5 hours to make a repair, the total man-hours (Block A41) would be 7.5 hours and the elapsed maintenance time would be 2.5 hours.

Technical Directive Identification Blocks

Enter the 12-character code that identifies the specific technical directive which directs the change incorporated or being incorporated in the type equipment identified in Block A48. This block is divided into seven sections and the data is entered in each section as follows:

(a) Block F08—Interim. Enter an (x) mark to indicate an interim type directive; otherwise leave blank.

(b) Block F09—Code. Enter the two-character code that denotes the type of directive being incorporated. Directive codes are listed in OPNAVINST 4790 (Series).

(c) Block F11—Basic Number. Enter in this four-character space the basic technical directive number. Enter the basic number only preceded by a zero or zeros necessary to total four characters.

(d) Block F15—RV (Revision). Enter the one letter that denotes the specific revision of the basic technical directive. Leave blank, if not applicable.

(e) Block F16—Am (Amendment). Enter the amendment number of the basic technical directive. Leave blank, if not applicable.

(f) Block F17—Part. Enter the two-character part designation of the basic directive. Leave blank, if not applicable.

(g) Block F19—Kit. Enter the two-character designation of the specific kit incorporated. If no kit is required, enter 00 in this section. If the kit designation is a letter (meaning a change kit that does not apply to an item installed on the aircraft), enter this letter.

Block A48—Type Equip (Type Equipment Code)

Enter the type equipment code that describes the end item on which work is being performed. Type equipment code structuring is explained in OPNAVINST 4790 (Series).

Block A52—BU/SER Number (Bureau/Serial Number)

Enter the bureau or serial number of the equipment or end item on which work is being performed. If more than six digits, enter only the last six. This block must not be blank. Enter 0 in this block when using the VIDS/MAF to document work on a group of like items (jacks, stands, common aeronautical equipment, or items not identified by a bureau or serial number).

Block A58—Discd (When Discovered Code)

Enter the applicable When Discovered Code. When Discovered Codes are listed in OPNAVINST 4790.2 (Series).

Block A59—T/M (Type Maintenance Code)

Enter the type maintenance code that describes the type of maintenance being performed. Type maintenance codes are listed in OPNAVINST 4790.2 (Series).

Block A60—Posit (Position Sensitive Indicator)

Enter the two-digit code (PSI) as applicable.

Block A62—FID (Fault Isolation Detection)

Leave the space blank; it is reserved for future use.

Block A65—Safety (EI) Engineering Investigation Serial Number

Enter the four-digit Safety EI Serial Number; precede with zero(s) where necessary to complete the block.

Block A69—Meter

Enter the GSE meter reading. This block is used at AIMD/IMAs only.

Block A74—Leave Blank

(Reserved for future expansion.)

Block F21—Inventory Transaction

Enter the one-digit inventory code that describes the status of the equipment during the transaction.

Block F22—Permanent Unit Code

Enter the six-digit PUC of the organization completing the transaction. (Used at the organization level only.)

Block F28—Leave Blank

(Reserved for future expansion.)

Repair Cycle Blocks

(a) Received Block

(1) Block B08—Date. Enter the Julian date the repairable component was received at the Administrative Material Screening Unit (AMSU). In the case of SCIR (Subsystem Capability and Impact Reporting) related discrepancies, enter the Julian date the discrepancy was reported.

(2) Block B12—Time. Enter the time the discrepancy was reported.

(3) Block B16—EOC (Equipment Operational Capability). Enter the appropriate EOC that describes the specific system or subsystem that degrades the equipment's capability.

(b) In Work Block

(1) Block B19—Date. Enter the Julian date work was begun on the discrepancy.

(2) Block B23—Time. In the case of SCIR related discrepancies, enter the time work was begun on the discrepancy; otherwise leave blank.

(3) Block B27—EOC. Enter the appropriate EOC that describes the specific system or subsystem that degrades the mission capability.

(c) Completed Block

(1) Block B30—Date. Enter the Julian date the maintenance action was completed—the equipment was repaired or judged to be BCM (Beyond Capability of Maintenance).

(2) Block B34—In the case of SCIR related discrepancies, enter the time the repair action was completed; otherwise leave blank. The SCIR system is used to monitor mission capability of selected end items. SCIR is documented on the VIDS/MAF concurrently with the maintenance action that caused the reduction of the equipment mission capability. This system provides managers with the degree of mission impairment, the length of time the aircraft's capability was reduced, the system or subsystem that caused mission impairment, and maintenance or supply impact on aircraft capability.

Awaiting Maintenance Reason and Hours Blocks

(a) Blocks B38 through B49. Enter the applicable AWM (Awaiting Maintenance) hours and Reason Codes for SCIR related maintenance actions. These blocks are filled out at the end of the maintenance action or upon close out. Order of importance may be determined by local policy.

Maintenance Supply Record Blocks

(a) Blocks B53, B65, C08, etc.—Job Status. Enter the proper prefix letter for any change in status. The letters "M" (Maintenance) and "S" (Supply) are used. As an example, the prefix "S" is used when maintenance is halted due to awaiting parts. The prefix "M" is used to indicate the end of an AWP status.

(b) Blocks B54, B66, C09, C21, etc.—Date. Enter the Julian date the "S" or "M" situation begins.

(c) Blocks B58, B70, C13, C25, etc.—Time. Enter the time the "S" or "M" situation begins.

(d) Blocks B62, B74, C17, C29, etc.—EOC. Enter the appropriate EOC that describes the specific system or subsystem that degrades the mission capability—SCIR related discrepancies only.

Removed/Old Item Blocks

Blocks E08 through E52. You should complete these blocks on the VIDS/MAF when a repairable component's part is removed from the item or major component on which work is being performed. Enter the manufacturer's code, serial number, and part number. (If the part number is more than 15 characters, enter the last 15.) In block E38 enter the Julian date the repairable part is removed from the equipment. In block E42 enter the meter reading from the removed component. The time or cycles blocks E47 and E52 may be used for specific meter time documented against an end item's major component.

Installed/New Item Blocks

Blocks G08 through G48. These blocks are completed on the VIDS/MAF when a repairable component or part is installed on the item or major component on which work is being performed. Enter the manufacturer's code, serial number, and part number. (If the part number is more than 15 characters, enter the last 15.) In Block G38 enter the applicable time/cycle preceded by a letter listed in Appendix J. The time/cycle blocks G43 and G48 may be used for specific meter time documented against an end item's major component replacement.

Removed/Installed Item Blocks

These blocks are completed when cannibalization actions are recorded, or when action taken code P, Q, or R is used. No entries are made in these blocks when the action taken code is L, N, S, or when removing items for check, test, or service and for their subsequent reinstallation.

Discrepancy Block

Enter a narrative description of the reported discrepancy.

Corrective Action Block

Enter a narrative description of the action taken to correct the discrepancy.

Blocks A08 through A17—JCN (Job Control Number)

Enter the assigned Job Control Number. In the case of a maintenance action being performed on a transient aircraft (Navy or non-Navy), the first three positions of the JCN, Block A08, are always the organization code of the aircraft reporting custodian.

For subcustody GSE (Ground Support Equipment), or GSE in the custody of another department that requires repair by the AIMD/IMA, the JCN is assigned by AIMD/IMA Production Control, reflecting the AIMD/IMA Organization Code.

Block A19—Work Center

Enter the code of the work center performing the maintenance action described on the VIDS/MAF. Work Center codes are listed in OPNAVINST 4790.1B.

Blocks A, B, C, and D—Local Use

These are blank blocks available for local use. Possible uses of these blocks include the Julian date and serial number of a Production Control Number (PCN) in block C, if block A19 is used to identify the assigned work center. The work priority or date due out of the AIMD/IMA may be annotated in block D. Also, work priority, supply project code, estimated completion time, or crew size may be entered in block D.

CF REQ/RFI Block

This is a dual purpose block for use by the organizational and intermediate activities. The organizational activity enters an "x" mark if a check flight is required after completion of the maintenance action. The intermediate maintenance activity enters an "x" if the repair action is Ready For Issue (RFI).

QA REQ/BCM Block

This is a dual purpose block for use by the organizational and intermediate activities. The organizational activity enters an "x" if the maintenance action requires a Quality Assurance Representative Inspection; this entry is not applicable to a Collateral Duty Inspection. The intermediate maintenance activity enters an "x" if the repair action is Beyond Capability of Maintenance (BCM) as shown in figure 1-4.

Turn-In Document Block

Enter the Julian date and requisition document number on which the specific item was ordered from the Failed/Required Material Block 45 and 49, to assist in local supply control.

Inspected By Block

An inspection for proper standards is performed by the quality assurance representative or collateral duty inspector. The signature and rate of this inspector is placed in this block.

Corrected By Block

The signature and naval rating of the worker or crew leader who performs the maintenance action is entered in this block.

Supervisor Block

The signature and rank of the work center supervisor or the assistant work center supervisor are entered in this block to indicate that screening and other appropriate action has been performed.

SUPPORT ACTION FORM

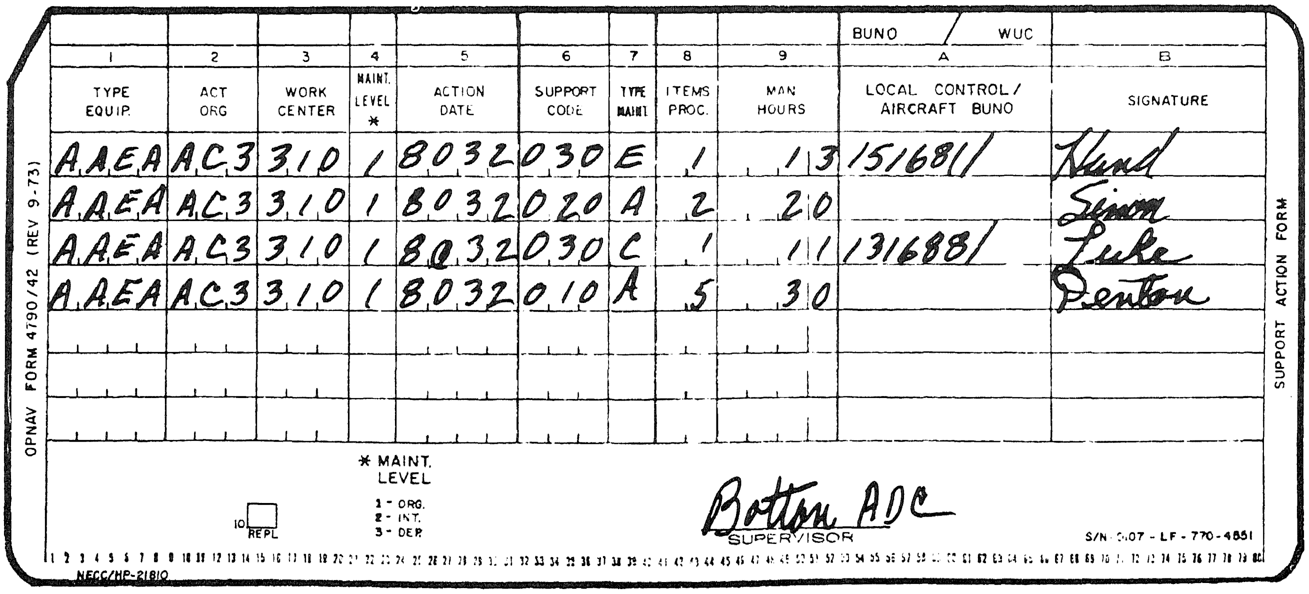
Another form you use to document maintenance is the Support Action Form (SAF), OPNAV 4790/42, as shown in figure 1-5. The SAF is designed for the separate reporting of support data so that time used to perform repetitive-type tasks that consume many man-hours (but do not involve malfunction, repairs, or condemnation action) may be easily identified, reported, and monitored. Man-hours expended in support duties such as aircraft refueling and other minor tasks are documented on the SAF, OPNAV Form 4790/42. The SAF may be either filled out by hand, prepunched, or preprinted, depending on the wishes of local maintenance managers. In either case, all SAFs are signed by the work center supervisor to indicate that screening has been completed.

SUPPORT ACTION CODES

To identify man-hours expended in specific categories of support work, three-character codes known as support action codes are used. The nine basic categories of support type work and their codes are listed together with type maintenance codes on the back of the SAF. The support codes are further broken down within basic categories as necessary by local command; i.e., 011, 012, et al. In the event such a breakdown is desired, its use is controlled by the maintenance officer, and coordinated by the Analysis Section. The areas of support covered by each basic category are defined in detail in OPNAVINST 4790.2 (Series).

INTERNAL FLOW

The SAF is initiated in the work center. At the completion of a support action, if you



OPNAV FORM 4790/42 (REV 9-73)

SUPPORT ACTION FORM

									BUNO / WUC	
1	2	3	4	5	6	7	8	9	A	B
TYPE EQUIP.	ACT ORG	WORK CENTER	MAINT. LEVEL *	ACTION DATE	SUPPORT CODE	TYPE MAINT	ITEMS PROC.	MAN HOURS	LOCAL CONTROL/ AIRCRAFT BUNO	SIGNATURE
AAEA	AC3	310	1	8032	030	E	1	13	151681/	Hand
AAEA	AC3	310	1	8032	020	A	2	20		Simon
AAEA	AC3	310	1	8032	030	C	1	11	131688/	Luke
AAEA	AC3	310	1	8032	010	A	5	30		Denton

* MAINT. LEVEL
1 - ORG.
2 - INT.
3 - DEP.

10 ☐ REPL

Botton ADC
SUPERVISOR

S/N 0107 - LF - 770 - 4851

NECC/HP-21810

Figure 1-5.—Completed SAF action card (multiple action).

document the action sign your name in block B and forward the completed SAF to the work center supervisor.

The signature of the work center supervisor in this block attests that all entries are valid, correct, and that all tools have been accounted for at the completion of the task. After verification, the work center supervisor forwards the completed SAF(s) to the analysis section for further processing by the Data Services Facility (DSF). Upon completion of key punching, the analysis section returns the completed SAF to the work center supervisor for verification against the Daily Audit Report.

DATA ELEMENTS AND DOCUMENTATION PROCEDURES

SAFs are documented in the following manner:

Block 1—Type Equipment Code

If the form is not preprinted or prepunched, enter the four-character code that identifies the equipment on which support work is being performed.

Block 2—Action Organization

Enter the three-character code that identifies the organization accomplishing the support action.

Block 3—Work Center Code

Enter the three-character code that identifies the work center performing the support action.

Block 4—Maintenance Level

Enter the one-character code that identifies the maintenance level of the support action being performed. (These codes are printed on the front of the SAF.)

Block 5—Action Date

Enter the Julian date the support action was completed.

Block 6—Support Code

Enter the three-character code that identifies the category of work in which the support action was performed (see the back of the SAF).

Block 7—Type Maintenance Code

Enter the one-character code that identifies the type of support maintenance performed.

Block 8—Item Processed

Enter the number of items processed, or the number of times that the support action identified in the Support Code block has been performed. These are actions such as: three corrosion prevention inspections performed (enter '3'). The assisting work centers enter "0 items processed".

Block 9—Man-Hours

Enter the total number of man-hours (in hours and tenths) expended in the performance of the support action(s) documented on the same line of the SAF. A maximum of 999.9 man-hours may be reported on the one-line entry.

Block A—Local Control/Aircraft Bureau Number

When the support code is a number from 040 to 049, the serial number of the aircraft is entered in this block because the support action involves corrosion control. In other cases, this block may be used at the discretion of the local activity to record serial numbers or other data of interest, up to a maximum of 15 characters. If the serial number is used, it is entered in the left-most portion of the block followed by a slash (/) mark. Data entered in Block A appears on the appropriate data products.

Block B—Signature

Enter the signature of the person documenting the support action.

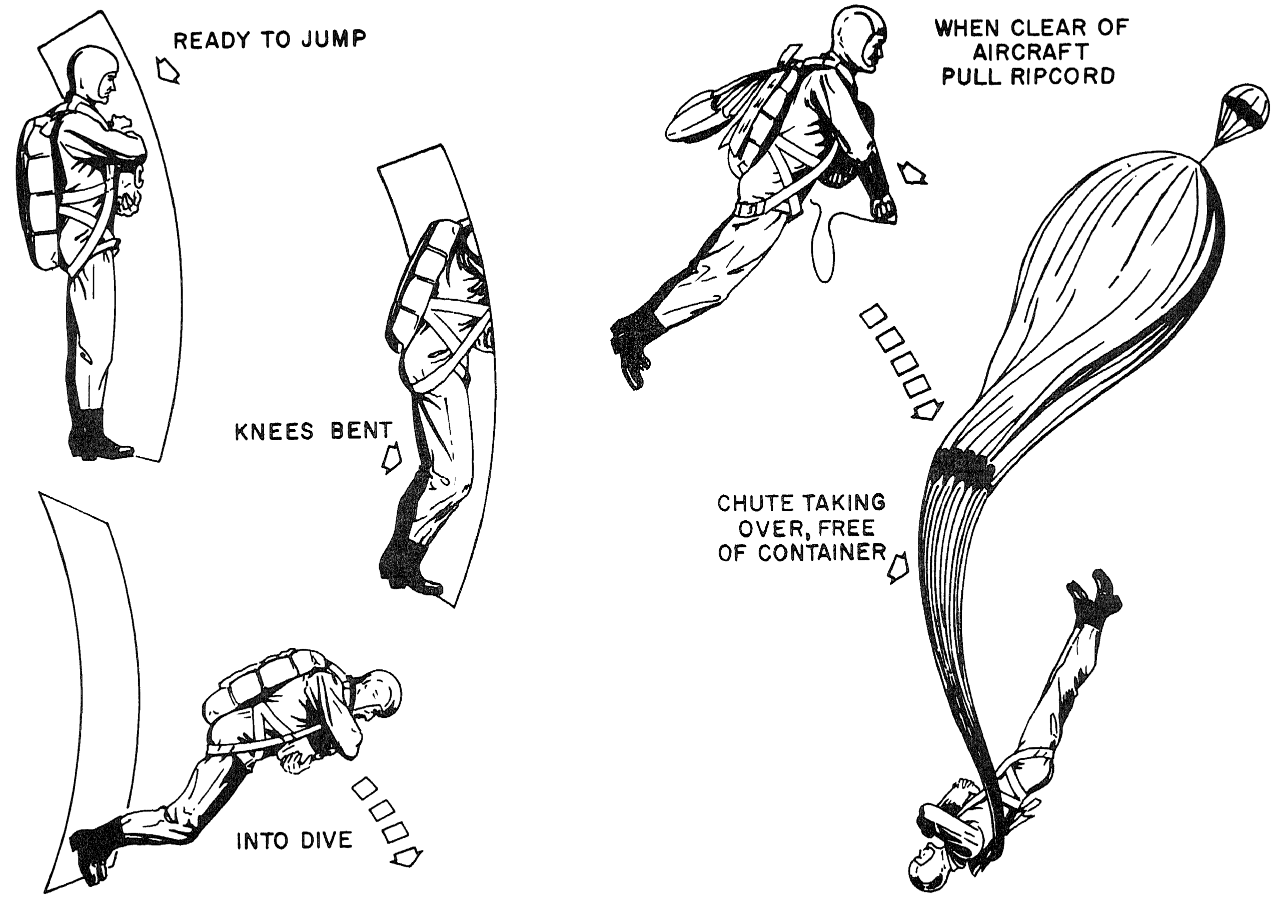
Block 10—Replenishment

This block is used to obtain more preprinted or prepunched cards. If preprinted/prepunched cards are authorized and desired, enter a check mark in this block for replenishment. No other entry is authorized on a replenishment SAF. If more than 25 prepunched cards are desired, enter the desired number in the local control block.

CHAPTER 2

PERSONNEL PARACHUTE FAMILIARIZATION

A parachute appears somewhat similar to a giant umbrella. By offering a large air-resisting or drag surface the parachute, when opened, provides the deceleration necessary to allow for the safe descent of an aircrewman. In each parachute jump a sequence of events shown in figure 2-1 takes place. After the parachutist clears the aircraft, he pulls the ripcord. The ripcord pins are removed from the locking cones, permitting the grommets to separate from the locking cones.


READY TO JUMP
KNEES BENT
INTO DIVE
WHEN CLEAR OF AIRCRAFT PULL RIPCORD
CHUTE TAKING OVER, FREE OF CONTAINER

239.110

Figure 2-1.—Aircraft agress, pilot chute deployed, and main canopy free of container.

The container spring opening bands pull the side and end flaps apart allowing the pilot chute to spring beyond the negative pressure area immediately above the falling body. This results in its getting a better "bite" on the surrounding air, thus speeding the opening of the canopy.

The aircrewman falling away from the pilot parachute causes the main canopy to be pulled from the container assembly, followed by the suspension lines. The canopy begins to fill with air during this operation.

The ties on the risers break as the load is applied. The lift webs are then pulled from the container while the canopy fully opens; at this point the parachutist receives the opening shock as the parachute fills with air. The aircrewman then hangs or sits suspended in the harness during the descent.

There are many different types of parachutes used in today's naval aircraft. To really understand the operating principles of a parachute you should first know the basic design and construction of a parachute and its components.

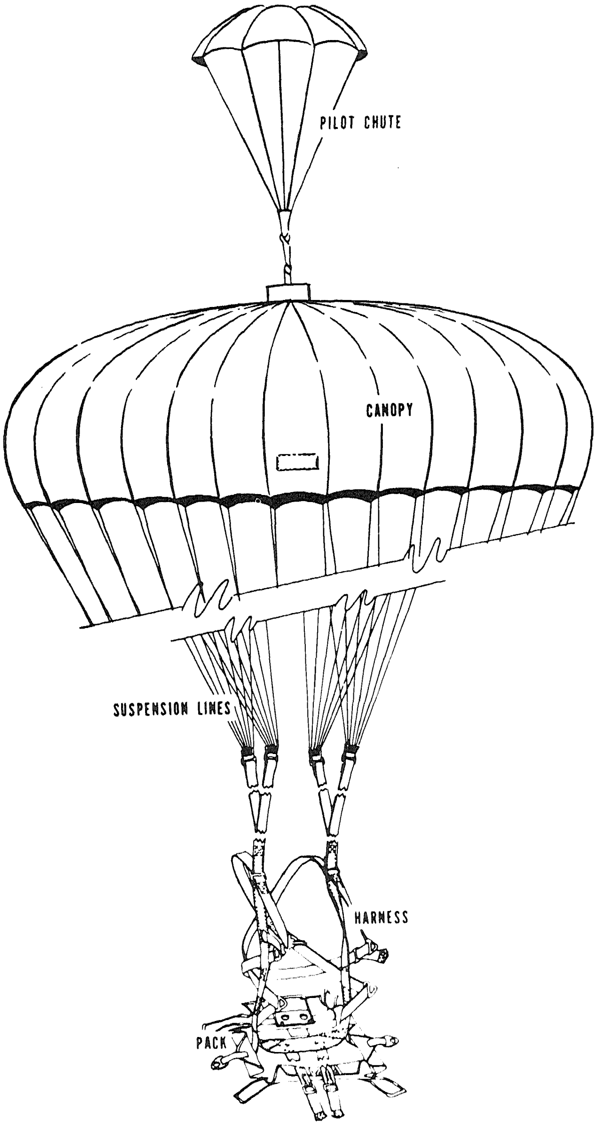
COMPONENTS OF PARACHUTES

The design and construction of a parachute and its components are based on the old idea that a chain is only as strong as its weakest link. Every component, or link from the jumper to the canopy must carry its share of the maximum load which is applied during the opening shock.

The five major parts of a standard service parachute, starting at the top and working down, are the pilot chute, main canopy, suspension lines, harness, and pack. These five major parts are shown in figure 2-2.

PILOT CHUTE

The pilot chute has the job of anchoring itself in the airstream, then pulling the remaining packed components out of the parachute pack. The order of deployment for most parachute assemblies is: the pilot chute, the canopy, the suspension lines, and the risers. A typical pilot chute is shown in figure 2-3.

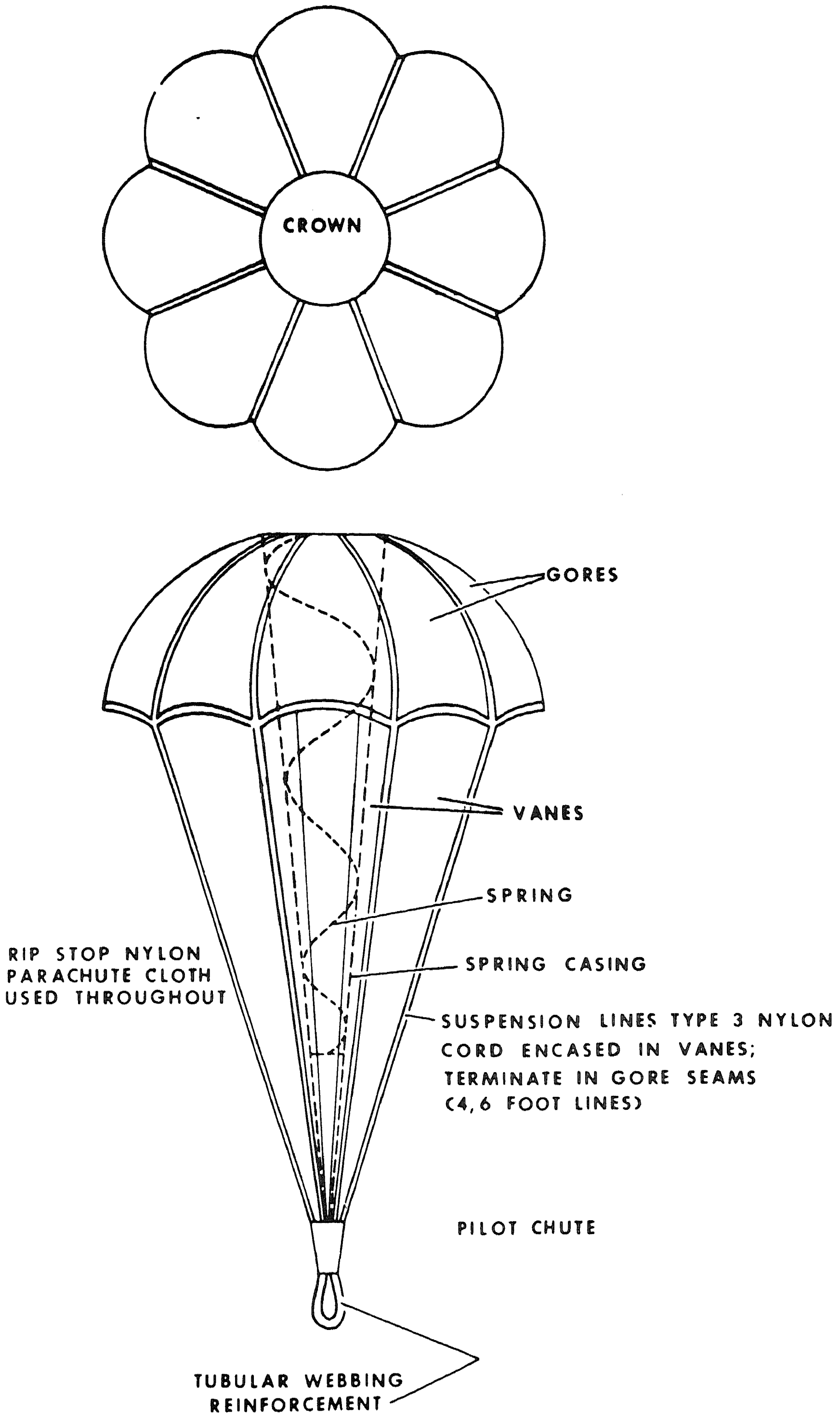


239.120

Figure 2-2.—The five major parts of a parachute.

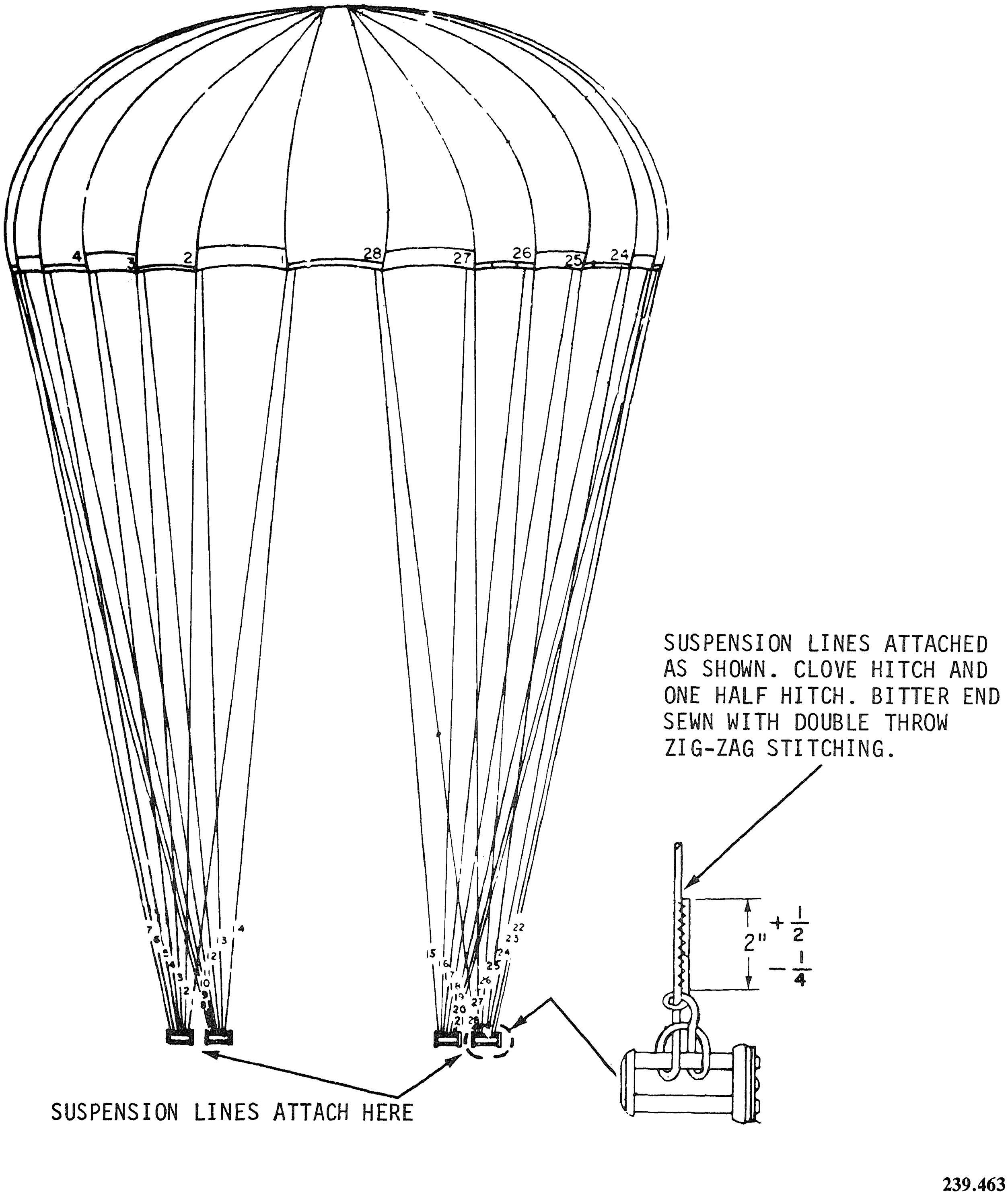
CANOPIES

Four sizes of canopies are used in naval aviation. They are the 35-foot, 28-foot, 26-foot, and 24-foot sizes. The 28-foot canopy is the size dealt with in this chapter and is most commonly described as a polygon, having 28 sides, and a diameter of 28 feet plus or minus one inch. The 28-foot canopy contains approximately 796 square feet of nylon cloth, plus 2,400 yards of nylon


CROWN
GORES
VANES
SPRING
RIP STOP NYLON PARACHUTE CLOTH USED THROUGHOUT
SPRING CASING
SUSPENSION LINES TYPE 3 NYLON CORD ENCASED IN VANES; TERMINATE IN GORE SEAMS (4,6 FOOT LINES)
PILOT CHUTE
TUBULAR WEBBING REINFORCEMENT

239.121

Figure 2-3.—Pilot Chute.

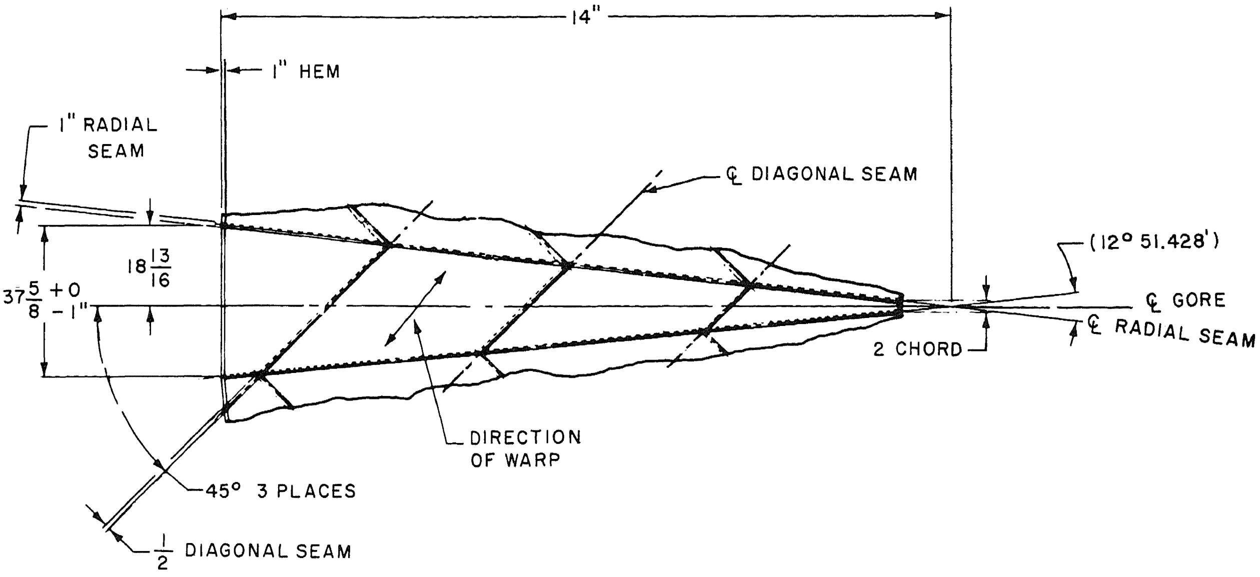


SUSPENSION LINES ATTACHED AS SHOWN. CLOVE HITCH AND ONE HALF HITCH. BITTER END SEWN WITH DOUBLE THROW ZIG-ZAG STITCHING.

SUSPENSION LINES ATTACH HERE

239.463

Figure 2-4.—Suspension lines on 28-foot canopy.



239.123.1

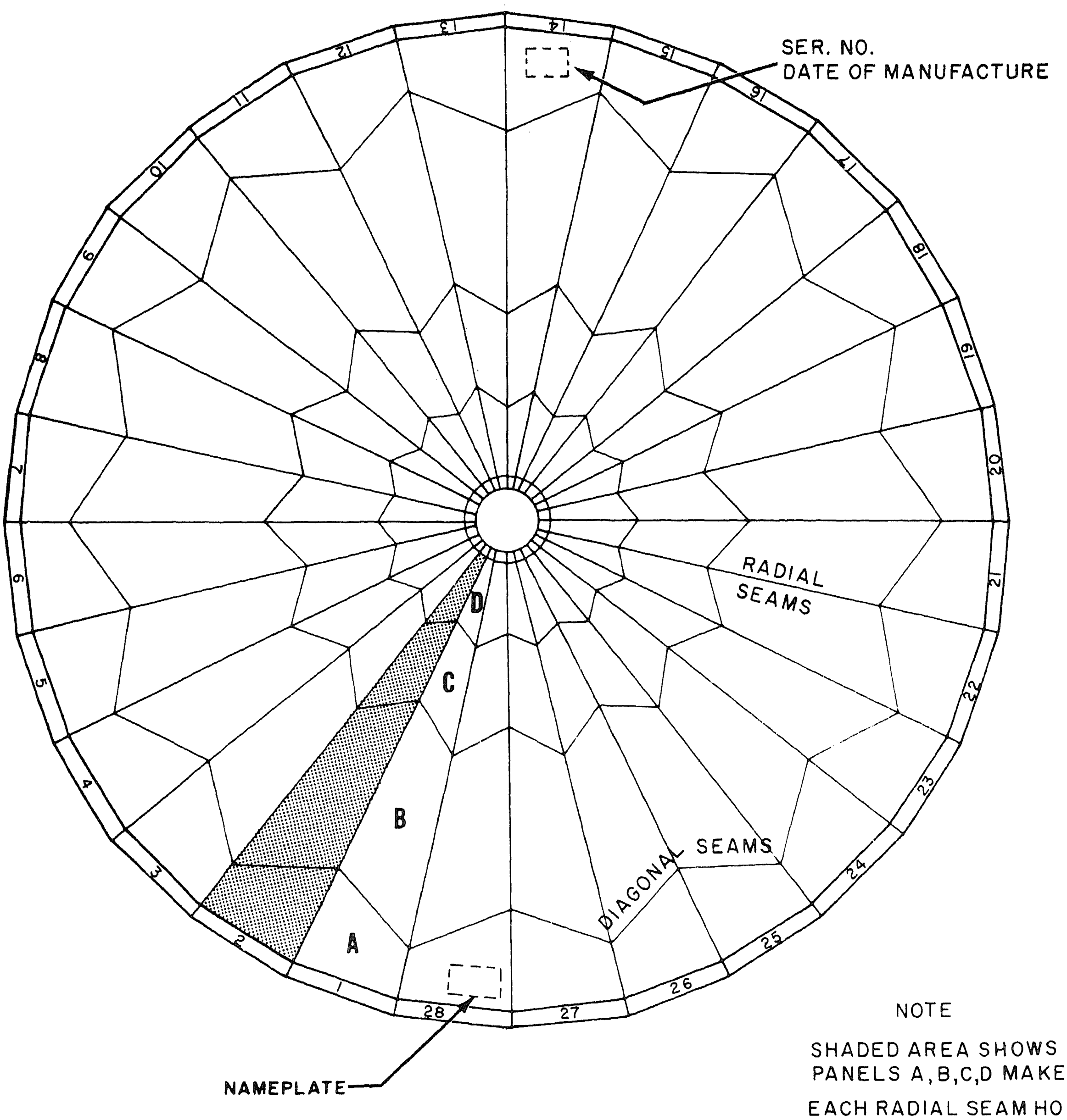
Figure 2-5.—Close-up view of a gore.

thread. The sewing on a parachute varies from eight to ten stitches per inch. The cloth that is used in the construction of a parachute canopy is high-tensile strength, 1.1 ounce ripstop nylon. Ripstop nylon cloth must meet the following minimum requirements: tensile strength—42 pounds per square inch; tear strength—five pounds; air permeability—80 to 100 cubic feet per min. To properly define the above terms: Tensile strength is the greatest stress cloth can withstand along its length without rupturing, expressed as a number of pounds per square inch. Tear strength is the average force, expressed in pounds, required to continue a tear across either the filling or the warp of the cloth. Air permeability is the measured amount, in cubic feet, of the flow of air through a square foot of cloth in one minute under a specific pressure.

The suspension lines are sewn into the canopy. These lines run continuously from the connector link on one side, through the canopy, and to the connector link on the other side (see figure 2-4). The material between any two suspension lines is called a gore. There are 28 gores in a 28-foot canopy. Each gore is composed of four sections identified by the letters A, B, C, and D (figure 2-5), starting with the bottom section. Figure 2-6 is a flat view of the entire canopy and note 1 in the figure shows the relationship of the gore in figure 2-5 to the rest of the canopy.

Most woven cloth has two types of threads—warp and filling. These two types are identified by their relationship to the selvage edge. A selvage edge is a finished edge on two sides of a piece of fabric to prevent raveling. This finished edge sometimes has a narrow border of different threads or sometimes it may have a different weave. Warp thread runs parallel to the selvage edge of cloth and runs lengthwise down a roll of fabric. Filling thread runs perpendicular to the selvage edge or crosswise across the width of the cloth.

The sections used in a parachute canopy are cut at a 45° angle to the centerline of the gore. This is called bias construction and provides maximum strength and elasticity. The radial and

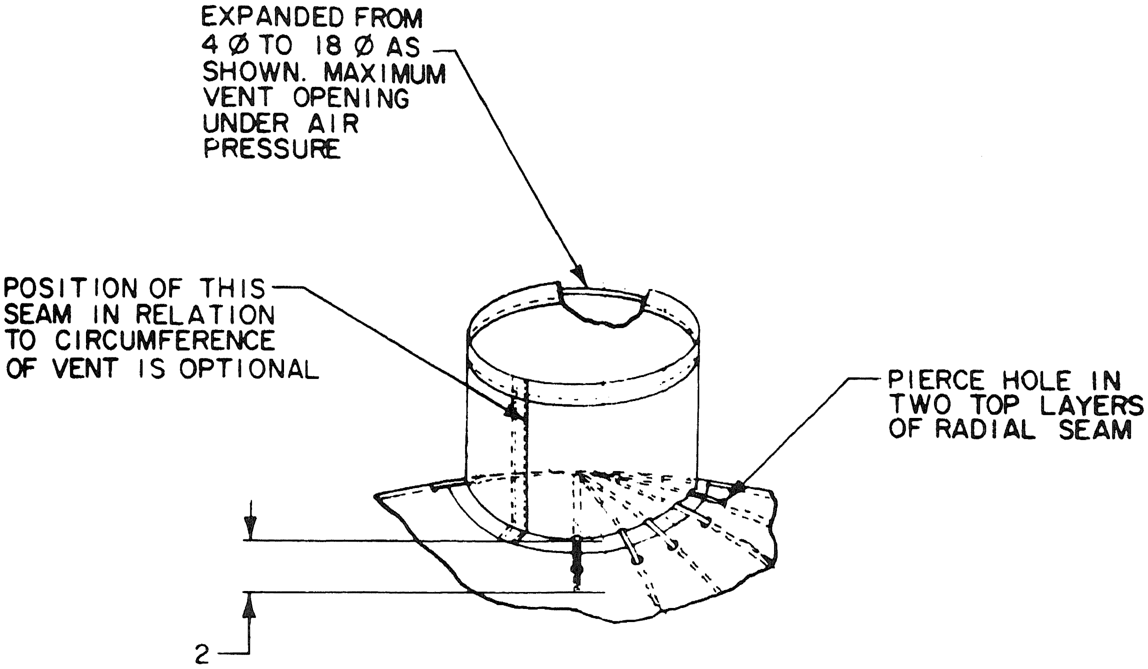


NOTE
SHADED AREA SHOWS
PANELS A,B,C,D MAKE
EACH RADIAL SEAM HO
A SUSPENSION LINE.

23ꞔ

Figure 2-6.—Flat view showing bias construction on a 28-foot canopy.

diagonal seams are double lapped for security. The suspension lines are enclosed in the channel produced by stitching the radial seams. Figure 2-6 shows a flat view of this bias construction of the 28-gore canopy. Note the location of the following markings: Stenciled on the top center gore (section A of gore 28) in letters one-half inch l and about twelve inches from the bot of the canopy are the NAVAIRFAC o number, date of manufacture, serial num and the manufacturer's mark or trade m Stenciled on the diametrically opposite


EXPANDED FROM 40 TO 180 AS SHOWN. MAXIMUM VENT OPENING UNDER AIR PRESSURE
POSITION OF THIS SEAM IN RELATION TO CIRCUMFERENCE OF VENT IS OPTIONAL
PIERCE HOLE IN TWO TOP LAYERS OF RADIAL SEAM
2

239.465

Figure 2-7.—Vent.

(section A of gore 14) is the date of manufacture and serial number.

If you should have to add markings to the canopy, the marking fluid you use should be in accordance with Specification MIL-I-6903A, Amendment No. 1.

Note the vent pictured in figure 2-7. This vent acts as a relief valve and relieves the high internal pressure within the parachute at the instant of opening. Without this vent, an opening at high speed could result in a dangerous rupture of the canopy. The skirt (not shown) and vent hems are reinforced with 1-inch tubular nylon webbing with a tensile strength (T/S) of 4,000 pounds, to aid in preventing tears from completely separating the canopy.

All machine stitching, except zigzag, should conform to Type 301, Federal Standard 751, and should be not less than eight nor more than ten stitches per inch. Ends of all tape, webbing, and lines must be seared to prevent fraying. No waxes should be used. For sewing diagonal seams, either size B or E nylon thread may be used. Use size E thread for all other seams, zigzag stitching, and repairs.

Removable connector links provide a quick attachment for the canopy and suspension lines to the lift webs.

NOTE: The service life of a parachute canopy is seven years from the date it is placed in service or ten years from the date of manufacture whichever expiration date comes first. For the service life of all parachute components, refer to NAVAIR 13-1-6.2.1.

SUSPENSION LINES

The suspension lines form a net or skeleton for the canopy and absorb much of the shock load. Therefore, when being assembled, they must be placed under a 20-pound tension, marked, and cut as a group to assure equal distribution of the shock load. The 28 suspension lines counted at the links are actually 14 lines, 75 feet 4 inches in length. These lines run continuously from link to link; that is, each line is secured to a connector link on one side of the canopy, runs up and over the canopy, and down to a link on the opposite side.

Type III nylon suspension line having a minimum tensile strength of 550 pounds is used on all main canopies and vane type pilot chutes. This line consists of a loosely woven outer covering called a sleeve, and several strong inner cords called the core. This core provides the greater portion of the strength of the suspension line.

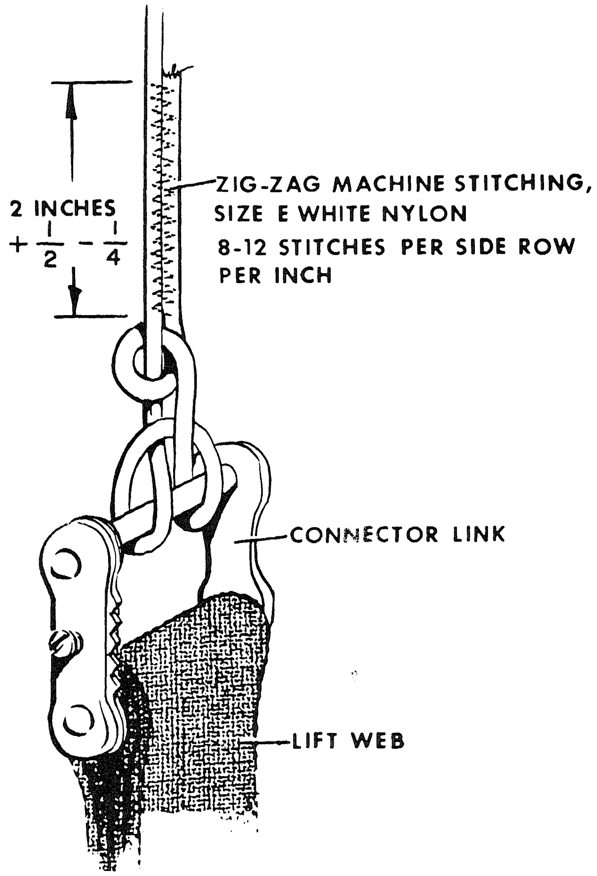
The suspension lines are attached to the connector links by tying a clove hitch, then a half-hitch, and completing the attachment with 2(+1/2 or −1/4) inches of zigzag stitching. These lines are attached to the lift webs with removable connector links. One of the four removable connector links is shown in figure 2-8. See the four links (the ends of the suspension lines with the links) in figure 2-4.

To prevent the canopy on the 28-foot parachute from slipping along the suspension lines, each line is anchored by zigzag stitching at several points to the radial seams through which it passes. One-half inch of slack is allowed in the vicinity of the skirt between the zigzag sewing points to relieve the strain during opening shock.

PARACHUTE CONTAINERS

The parachute container is designed to house and protect the pilot chute, main canopy, and suspension lines. There are as many different styles of containers as there are parachutes. They all have the same basic opening procedures. There are four flaps: top, bottom, left, and right. These flaps are held closed by two or four ripcord pins inserted through locking cones. To open the parachute container, the ripcord pins must be removed either manually or automatically. This allows the flaps to open and the pilot chute to spring from the pack. The pilot chute then pulls the canopy out.

NOTE: The service life of a container is 12 years from the date placed in service or 15 years from the date of manufacture, whichever date comes first.


2 INCHES
$+\frac{1}{2}-\frac{1}{4}$
ZIG-ZAG MACHINE STITCHING, SIZE E WHITE NYLON
8-12 STITCHES PER SIDE ROW PER INCH
CONNECTOR LINK
LIFT WEB

239.126
Figure 2-8.—Method of attaching suspension lines at the link.

PARACHUTE HARNESS

The harness is the part of the parachute that holds the parachute to the wearer. It is designed to absorb the largest part of the opening shock, with chest, leg, and back straps added to prevent the jumper's body from falling free from the chute on the way down. Personnel parachute harnesses are made of 1 3/4 inch-wide nylon webbing having a tensile strength from 6,000 to 8,700 pounds.

The Navy uses two types of harnesses. The first is the quick fit harness. It is made in three configurations: seat-type, back-type, and chest-type. The other type of harness is the integrated torso harness. It combines the harness, lap belt, and shoulder harness into one integrated garment. This harness improves the individual's comfort and mobility; it is more secure and is easier to put on and take off. It also reduces the number of exposed straps and overall bulk and weight.

NOTE: The service life of a harness (which is the same as the container) is 12 years from the date placed into service or 15 years from the date of manufacture, whichever time comes first.

RIPCORDS

The ripcord is a manual releasing device used to allow the container to open. It consists of locking pins securely attached to a length of 3/32-inch diameter corrosion-resistant steel cable. The ripcord handles are made of steel tubing in the shape of a cloverleaf or a trapezoid, and are attached by passing the cable through a small hole drilled in the grip and then swaging a retaining ball or clamping a small sleeve onto the loose end of the cable. The pins are swaged in place and tested to withstand a pull of 300 pounds.

HARNESS HARDWARE

Parachute harness fittings (hardware) are small metal devices usually made of cadmium or chrome-plated steel. They are designed to join the parachute and harness and to afford easy and rapid adjustment of the harness to the wearer.

The many types of parachute harness fittings include adapters, snaps, D-rings, V-rings, connector links, and Koch release adapters. Some of the more common types of these fittings and their tensile strengths are illustrated in figure 2-9.

ADAPTERS

Two types of adapters are used with a regular quick-fit type harness. They are the regular harness adapter and the friction adapter. The harness adjuster adapter is used to adjust the harness to the wearer and the friction quick-fit adapter has a grip slide bar which allows the wearer to make quick adjustments to the harness.

SNAPS

There are several types of snaps used with parachutes. They are the plain harness snap, the quick-fit snap, and the quick connector snap. The harness snap is a plain hook-shaped, spring-actuated guard which snaps over a V-ring to secure two parts of the harness together. The quick-fit snap is similar except that it has a grip slide bar. The quick-connector snap is similar to the harness snap and is used as a means to quickly attach the Navy chest type parachute to the two D-rings on the Navy chest type harness.

CONNECTOR LINK

Connector links are fittings designed to join the parachute to the harness. The suspension lines are attached to one side and the harness to the other. All are covered in more detail in a later chapter.

KOCH RELEASE ADAPTERS

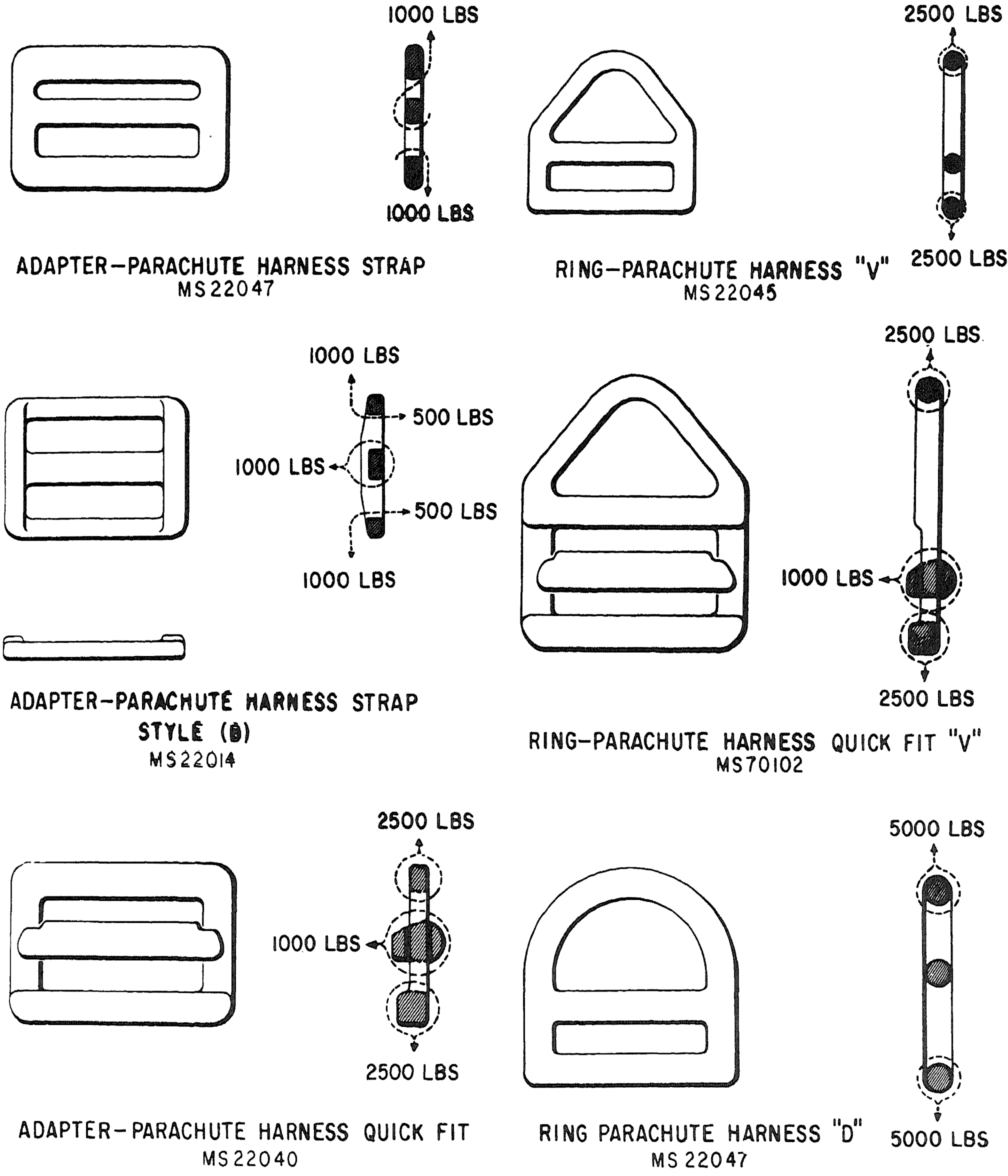
Integrated torso suit harnesses are equipped with four Kock release adapters which attach to the fittings on the lap belts and risers of the integrated parachute assembly. Release fitting adapters are manufactured in two parts—male and female.

The male portion of the adapter is attached to the torso suit harness, while the female portion is attached to the riser assembly of the parachute. Figure 2-10 shows the Koch parachute release adapters.

TRANSPORTING PARACHUTES

When issuing parachutes you may need to give some instructions to the aircrewmen on proper ways to carry and handle them. The most effective way to explain the proper handling of packed parachutes is to list a series of DO's and DON'T's.

1. DO NOT pick up a parachute by its risers or ripcord. Lift web tackings break relatively easily and when they do, the suspension lines are almost certain to become disarranged.



239.136

Figure 2-9.—Harness hardware (page 1).

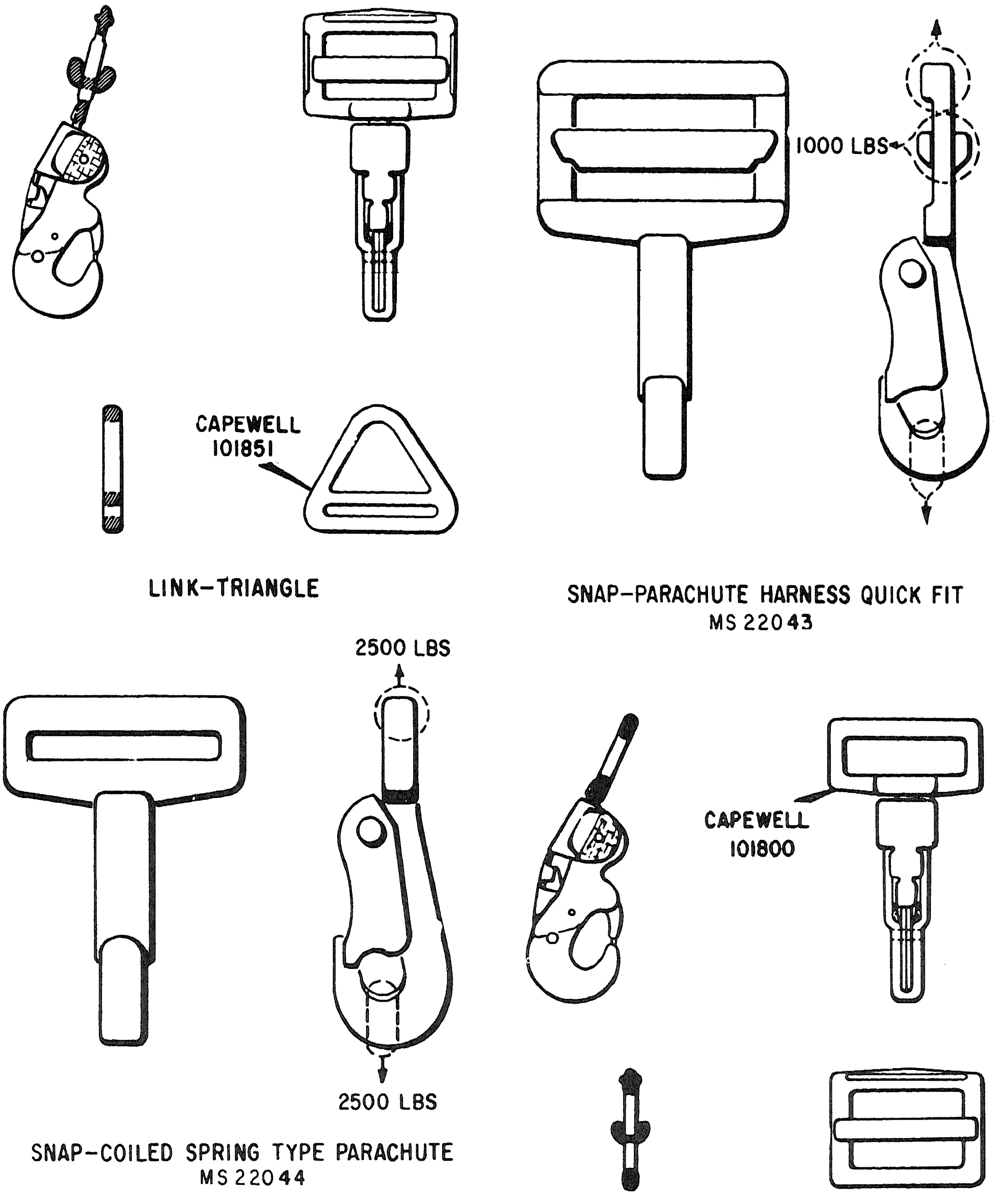
2. DO NOT allow a parachute to come in contact with light fixtures or heat sources. Heat tends to decompose the fabric.

3. DO take EVERY precaution to prevent soiling or contaminating parachute assemblies.

4. DO NOT stack parachute assemblies on top of each other or on the floor, unless they are in suitable shipping containers.

5.DO NOT leave a parachute where heavy objects can be dropped or placed on it. Permitting a parachute to be carried in a cargo net along with squadron cruise boxes or similar gear is an example of poor handling techniques.

6. DO use utmost CAUTION when handling parachute assemblies with installed cartridge activated devices.



LINK-TRIANGLE

SNAP-PARACHUTE HARNESS QUICK FIT
MS 22043

SNAP-COILED SPRING TYPE PARACHUTE
MS 22044

239.137

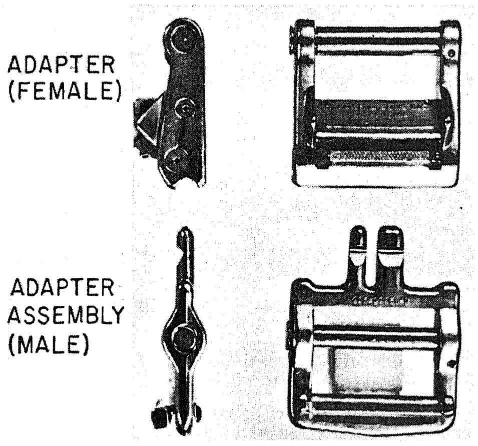
Figure 2-9.—Harness hardware (page 2).

7. DO NOT tack or tie a container with the parachute in the packed condition.

8. DO clean thoroughly vehicles used to transport parachute assemblies. DO check for contamination and provide with suitable covers during inclement weather.

SHIPPING CONTAINERS

Parachutes are shipped and/or stored in sealed shipping containers of either cardboard or metal construction and of suitable size. The containers are designed for



239.138

Figure 2-10.—Koch release adapters.

reuse and they must be opened and closed with care.

When you are using the container to return parachutes to supply or to transfer the assembly to another activity, ensure that the old tags and labels on the container are removed or marked out. Ensure that the proper tags and labels are attached and properly filled out on the transferring container. Tags and labels are shown in figure 2-11.

STORING

To place a parachute assembly into temporary storage, proceed as follows:

NOTE: This procedure is for parachute assemblies that are in a ready for issue (RFI) status only.

1. Inspect the parachute assembly, ensuring that it is in an RFI status. Check the name plate information with the recorded information on the parachute history card. Fill out an Aircraft Equipment Condition Tag, indicating the assembly name, serial number, and part number.

2. Remove and disarm the automatic actuator. (This is an explosive device used to automatically pull the ripcord on certain parachutes.)

3. Remove cartridges from all other cartridge actuated devices (these are other explosive devices used to assist in opening certain types of parachute canopies). Store the cartridges from explosive devices in accordance with existing instructions.

4. Release all snap fasteners, open all slide fasteners, and remove one end of each of the parachute container spring opening bands.

5. Chain the parachute suspension lines.

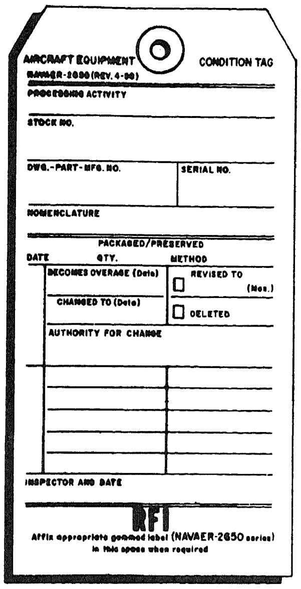
6. Remove the manual ripcord cable assembly and place it in a small paper or plastic bag.

7. Examine the shipping container for condition. Remove or mark out all old tags or labels on the container.

8. Place the ripcord assembly in a side pocket of the parachute bag or at the bottom of the container. Spread 1/8 pound of naphthalene flakes on top of the parachute container. Insert the suspension lines loosely and fold in the canopy, then sprinkle 1/4 pound of naphthalene flakes into the canopy fold. Lay the pilot parachute into the shipping container uncompressed.

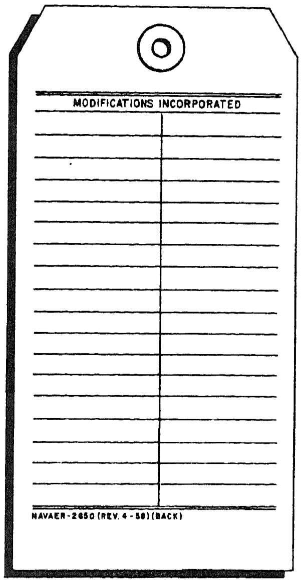
9. Close the shipping container; if a cardboard box is used, tape the flaps closed.

10. Place the parachute into storage according to local requirements.



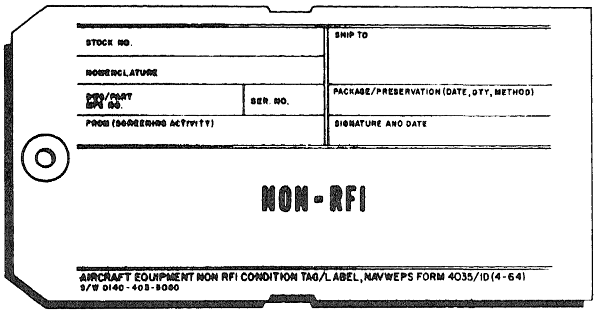
AIRCRAFT EQUIPMENT CONDITION TAG
NAVAER-2650 (REV. 4-58)
PROCESSING ACTIVITY
STOCK NO.
DWG.-PART-MFG. NO.
SERIAL NO.
NOMENCLATURE
PACKAGED/PRESERVED
DATE
QTY.
METHOD
BECOMES OVERAGE (Date)
☐ REVISED TO (Mos.)
CHANGED TO (Date)
☐ DELETED
AUTHORITY FOR CHANGE
INSPECTOR AND DATE
RFI
Affix appropriate gummed label (NAVAER-2650 series) in this space when required

READY FOR ISSUE TAG (FRONT)
(COLOR MANILA)



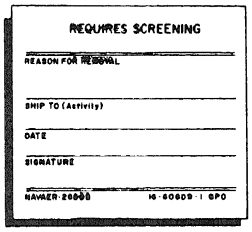
MODIFICATIONS INCORPORATED
NAVAER-2650 (REV. 4-58) (BACK)

READY FOR ISSUE TAG (BACK)
(COLOR MANILA)



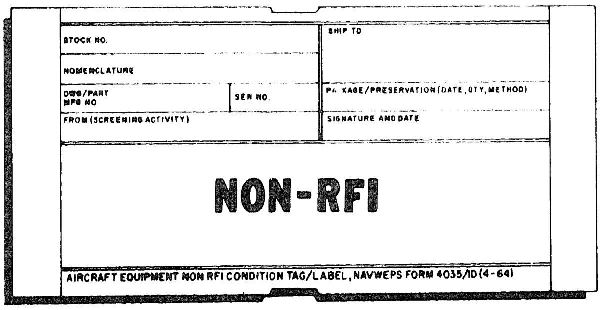
STOCK NO.
SHIP TO
NOMENCLATURE
DWG/PART MFG NO.
SER. NO.
PACKAGE/PRESERVATION (DATE, QTY, METHOD)
FROM (SCREENING ACTIVITY)
SIGNATURE AND DATE
NON-RFI
AIRCRAFT EQUIPMENT NON RFI CONDITION TAG/LABEL, NAVWEPS FORM 4035/1D (4-64)
S/N 0140-403-8000

NON READY FOR ISSUE TAG
(COLOR GREEN)



REQUIRES SCREENING
REASON FOR REMOVAL
SHIP TO (Activity)
DATE
SIGNATURE
NAVAER-2650B
16-60609-1 GPO

SCREENING LABEL
(COLOR BLUE)



STOCK NO.
SHIP TO
NOMENCLATURE
DWG/PART MFG NO
SER NO.
PACKAGE/PRESERVATION (DATE, QTY, METHOD)
FROM (SCREENING ACTIVITY)
SIGNATURE AND DATE
NON-RFI
AIRCRAFT EQUIPMENT NON RFI CONDITION TAG/LABEL, NAVWEPS FORM 4035/1D (4-64)

NON READY FOR ISSUE LABEL
(COLOR WHITE)

239.116

Figure 2-11.—Shipping tags and labels.

CHAPTER 3

PERSONNEL PARACHUTE INSPECTIONS

PR RESPONSIBILITIES

As a "PR" you have one of the most important jobs in Naval Aviation. The type of equipment you will be working with is life-saving equipment. Unlike the other components that make up the naval aircraft, the parachute has no backup system. If all other parts fail the parachute must function to prevent serious injury or death to the aircrewman.

Parachutes are primarily designed to allow pilots and aircrewmen to escape from disabled aircraft. The nature of this life-saving system leaves no margin for error in the work of the PR. Parachute inspections must be carefully conducted, ensuring security, rapid positive functioning, airworthiness, and comfort of the entire assembly.

Procedures for working with parachutes are different from other types of work in that whenever a critical operation is performed, the rigger's work must be inspected and its performance verified and recorded by a designated Collateral Duty Inspector (CDI) before work continues. Continuing with a procedure without obtaining the required inspection is prohibited. Although this constant interruption of work may seem inefficient, you must appreciate how important it is to the parachute user that every step is done exactly right.

REASONS FOR INSPECTING PARACHUTES

Depending on its use, a parachute is exposed to a large number of potentially destructive forces and agents. A parachute consists of many parts and is a complex and sometimes fragile assembly, so there are many chances for something to go wrong. Once a parachute has been inspected, repacked, and placed in service, it is moved around, sat on, leaned against, and in many ways subjected to forces that can cause chafe and wear. When installed in an aircraft or being worn, the parachute may be contaminated by a number of potentially harmful fluids such as perspiration, lubricants and hydraulic fluids, chemicals, and saltwater. Dampness can also get into the components from humid conditions.

Aside from inspecting for damage, new parachutes are inspected before being placed in service because it is possible for a mistake to be made when many persons are involved in a manufacturing process. A parachute may also require changes and modifications. These are promulgated by the Aircrew System Bulletins, Aircrew Systems Changes, and updated material entered in the *Aviation Crew Systems Personnel Parachute Manual*, NAVAIR 13-1-6.2.

As you can see, many things can happen to a parachute in service. Inspection schedules based on experience are established to ensure that damage is detected before it becomes serious. You have the responsibility of following these schedules and for properly doing the required inspections.

This chapter describes parachute inspections and how you should make them. The next chapter describes the explosive devices that are part of parachute assemblies and which are inspected with the parachute. These devices require special safety precautions and safety checks during the inspection of a parachute. By the time you have completed these two chapters you will have a good idea of the general procedures for inspecting parachutes.

INSPECTION SCHEDULES

The frequency and nature of parachute inspections depends on the use of the parachute. Those used regularly for jumping, such as parachutes assigned to SEAL teams are inspected and repacked after each use; these and others are on a different schedule than those intended for emergency use. Our discussion focuses on emergency parachutes to emphasize that although they are rarely used, they may be damaged in handling or exposed to hazards in their environment.

Emergency parachutes are assigned to operating units. They may be part of an aircraft inventory or they may be assigned to a ready issue room. To some extent, the frequency of their inspection depends on the type of aircraft to which they are assigned. Those assigned to attack or fighter aircraft are inspected more frequently than those on the larger patrol, cargo, or other planes where they are not sat upon or otherwise subjected to as many hazards.

Major inspections of emergency parachutes are done as a routine when the parachute is first put into service and then later at intervals to coincide with the time the aircraft is down for major maintenance.

Less extensive inspections which do not involve unpacking the parachute are daily, preflight, postflight, and special. These special inspections are done every seven days for OV, VA, VF, and VT aircraft; every ten days for the A-7; and every fourteen days for VP, VR, VS, VH, VW, and VC aircraft. Of course if any damage is found or suspected during these inspections, the assembly is sent to an Aviation Intermediate Maintenance Dept. (AIMD) for thorough inspection, testing and possible repair.

Several special inspections may also be done. For instance, after a combat mission the parachute assembly is inspected for missile damage from bullets or fragments. After an emergency use the entire parachute is shipped to the Naval Parachute Test Center for a detailed inspection. Other inspections may be ordered if defects are suspected in a group of parachutes or in association with authorized changes and modifications.

PARACHUTE MAINTENANCE

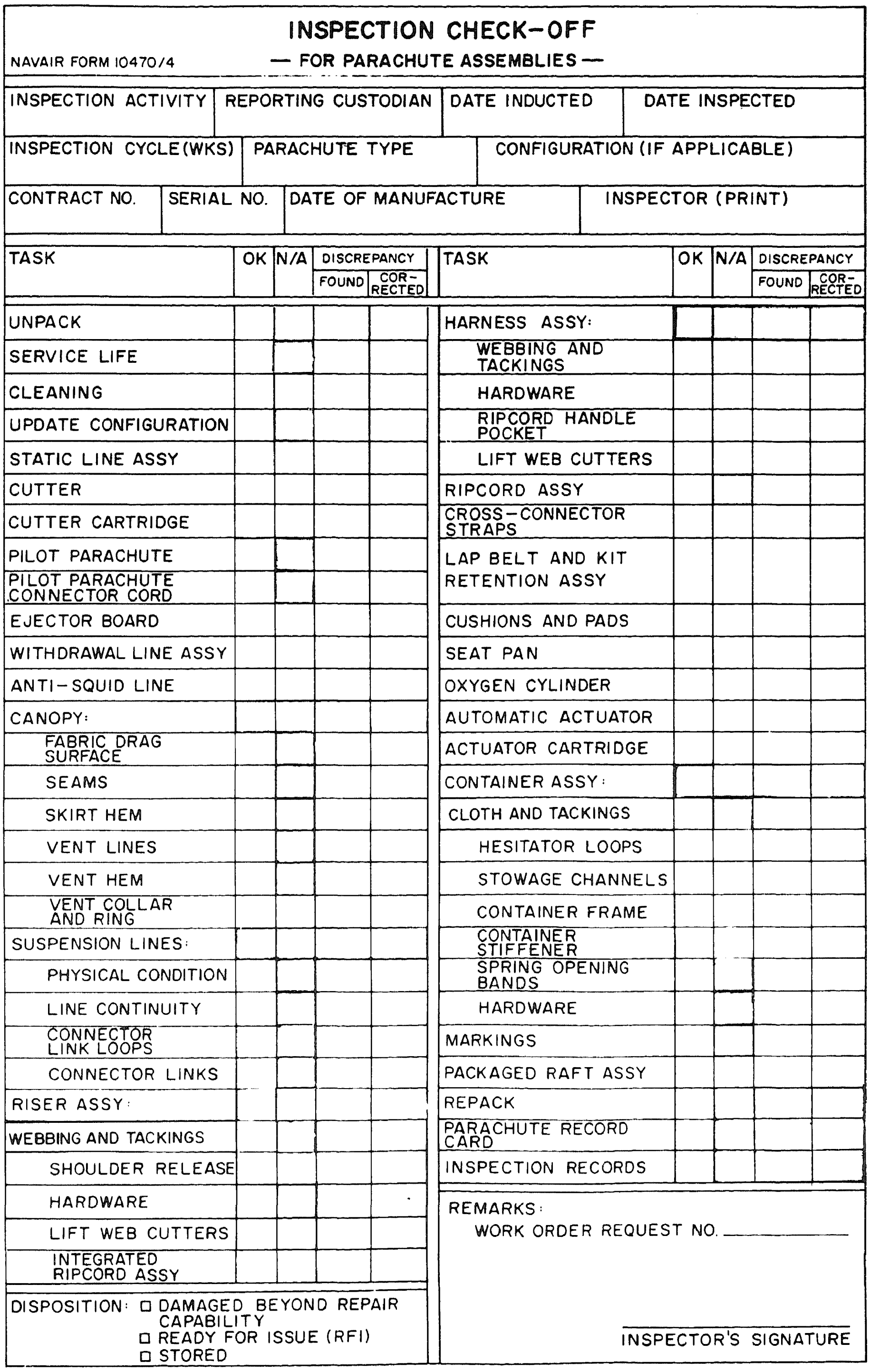
All parachutes shall be given periodic maintenance inspections under the direction and control of the Maintenance Control Officer. Maintenance is to be thorough at all times. No instance of careless treatment or neglect of parachute equipment is to be allowed to pass unnoticed. The vital function of this equipment must be uppermost in the minds of all personnel concerned.

SPECIFICATIONS

All parachute inspections are performed according to a checklist. The master source of the items to be checked and the schedules to observe is found in the *Aviation Crew Systems Personnel Parachute Manual,* NAVAIR 13-1-6.2. This is one volume of the set of authoritative publications discussed in Chapter 1 of this text. The actual guidelines you use on the job are in the form of shop process cards which list procedures from the NAVAIR 13-1-6.2. The cards are continually updated, and when using them, as in using any publication, you must first make sure that the current changes are included. The Shop Process Cards are job aids which list all of the proper steps, procedures, and points to inspect. They also give you information about proper specifications and other important technical data. These aids are used to ensure that all steps are followed, all details are inspected, and that quality control items are checked at the proper time by a Collateral Duty Inspector (CDI). By using these aids you make your work easier and ensure that you are following the current and approved procedures.

If shop process cards are not available for an inspection, or the available cards do not conform to current procedures listed in NAVAIR 13-1-6.2, an Inspection Check-off Form such as shown in figure 3-1 may be used. The form may be reproduced locally. The proper procedures must be listed, and the CDI verifications and inspections must be included. Use the form in conjunction with the manual or other authoritative reference.

Whenever a question on the construction of parachute equipment comes up, you should get and study the drawing that applies. Repairs which are difficult should be compared to the drawing



INSPECTION CHECK-OFF

NAVAIR FORM 10470/4

— FOR PARACHUTE ASSEMBLIES —

INSPECTION ACTIVITY	REPORTING CUSTODIAN	DATE INDUCTED	DATE INSPECTED
INSPECTION CYCLE (WKS)	PARACHUTE TYPE	CONFIGURATION (IF APPLICABLE)	
CONTRACT NO.	SERIAL NO.	DATE OF MANUFACTURE	INSPECTOR (PRINT)

TASK	OK	N/A	DISCREPANCY	
			FOUND	COR-RECTED
UNPACK				
SERVICE LIFE				
CLEANING				
UPDATE CONFIGURATION				
STATIC LINE ASSY				
CUTTER				
CUTTER CARTRIDGE				
PILOT PARACHUTE				
PILOT PARACHUTE CONNECTOR CORD				
EJECTOR BOARD				
WITHDRAWAL LINE ASSY				
ANTI-SQUID LINE				
CANOPY:				
FABRIC DRAG SURFACE				
SEAMS				
SKIRT HEM				
VENT LINES				
VENT HEM				
VENT COLLAR AND RING				
SUSPENSION LINES:				
PHYSICAL CONDITION				
LINE CONTINUITY				
CONNECTOR LINK LOOPS				
CONNECTOR LINKS				
RISER ASSY:				
WEBBING AND TACKINGS				
SHOULDER RELEASE				
HARDWARE				
LIFT WEB CUTTERS				
INTEGRATED RIPCORD ASSY				

TASK	OK	N/A	DISCREPANCY	
			FOUND	COR-RECTED
HARNESS ASSY:				
WEBBING AND TACKINGS				
HARDWARE				
RIPCORD HANDLE POCKET				
LIFT WEB CUTTERS				
RIPCORD ASSY				
CROSS-CONNECTOR STRAPS				
LAP BELT AND KIT RETENTION ASSY				
CUSHIONS AND PADS				
SEAT PAN				
OXYGEN CYLINDER				
AUTOMATIC ACTUATOR				
ACTUATOR CARTRIDGE				
CONTAINER ASSY:				
CLOTH AND TACKINGS				
HESITATOR LOOPS				
STOWAGE CHANNELS				
CONTAINER FRAME				
CONTAINER STIFFENER				
SPRING OPENING BANDS				
HARDWARE				
MARKINGS				
PACKAGED RAFT ASSY				
REPACK				
PARACHUTE RECORD CARD				
INSPECTION RECORDS				

DISPOSITION: ☐ DAMAGED BEYOND REPAIR CAPABILITY
☐ READY FOR ISSUE (RFI)
☐ STORED

REMARKS:
WORK ORDER REQUEST NO. ____________

INSPECTOR'S SIGNATURE

Figure 3-1.—Inspection check-off form.

to ensure that the finished product is the same as the one in the drawing. The drawing number or reference number of a particular piece of parachute equipment can be found in the applicable table entitled "Index of Drawings, NAVAIR 13-1-6.2.1 (Illustrated Parts Breakdown of Navy Parachutes)."

All parachute maintenance is done by the lowest level activity equipped to satisfactorily perform the work. Mission, time, equipment, trained personnel, and operational needs are the basic considerations involved in determining which level shall perform the work.

PARACHUTE INSPECTION AND MAINTENANCE RECORDS

The following records and documents are used by Aircrew Survival Equipmentmen, under the direction of the maintenance control officer, to provide a systematic means of control:

PREFLIGHT/DAILY/INFLIGHT/ POSTFLIGHT MAINTENANCE RECORD (OPNAV 4790/38)

Whenever you perform any of these routine inspections you must fill out an OPNAV Form 4790/38 (see figure 3-2). You also use this Preflight/Daily/InFlight/Postflight Maintenance Record Card to record the special (seven-, or fourteen-day) inspection in accordance with applicable Aircraft Maintenance Requirement Card decks and OPNAVINST 4790.2 (Series).

PARACHUTE CONFIGURATION, INSPECTION AND HISTORY RECORD (OPNAV 4790/101)

You will find this form to be the most helpful to you as a parachute rigger. The form gives you and your fellow workers a continuing record of a parachute assembly and its components throughout its service life. The form has two sheets, so a copy is automatically made when the original is filled in with a ball-point pen.

Initiation

The first activity to place a parachute into service initiates its Parachute Configuration, Inspection, and History Record as shown in figure 3-3. You must record all information legibly (clearly and readably) in the proper places on the form. The type of parachute, part number, canopy serial number, date placed in service (month/year), aircraft side number, and your activity's alphanumeric code are to be entered at the top of the history record. The form in the figure was prepared for a parachute being placed into service.

Cartridges and Cartridge-Actuated Devices

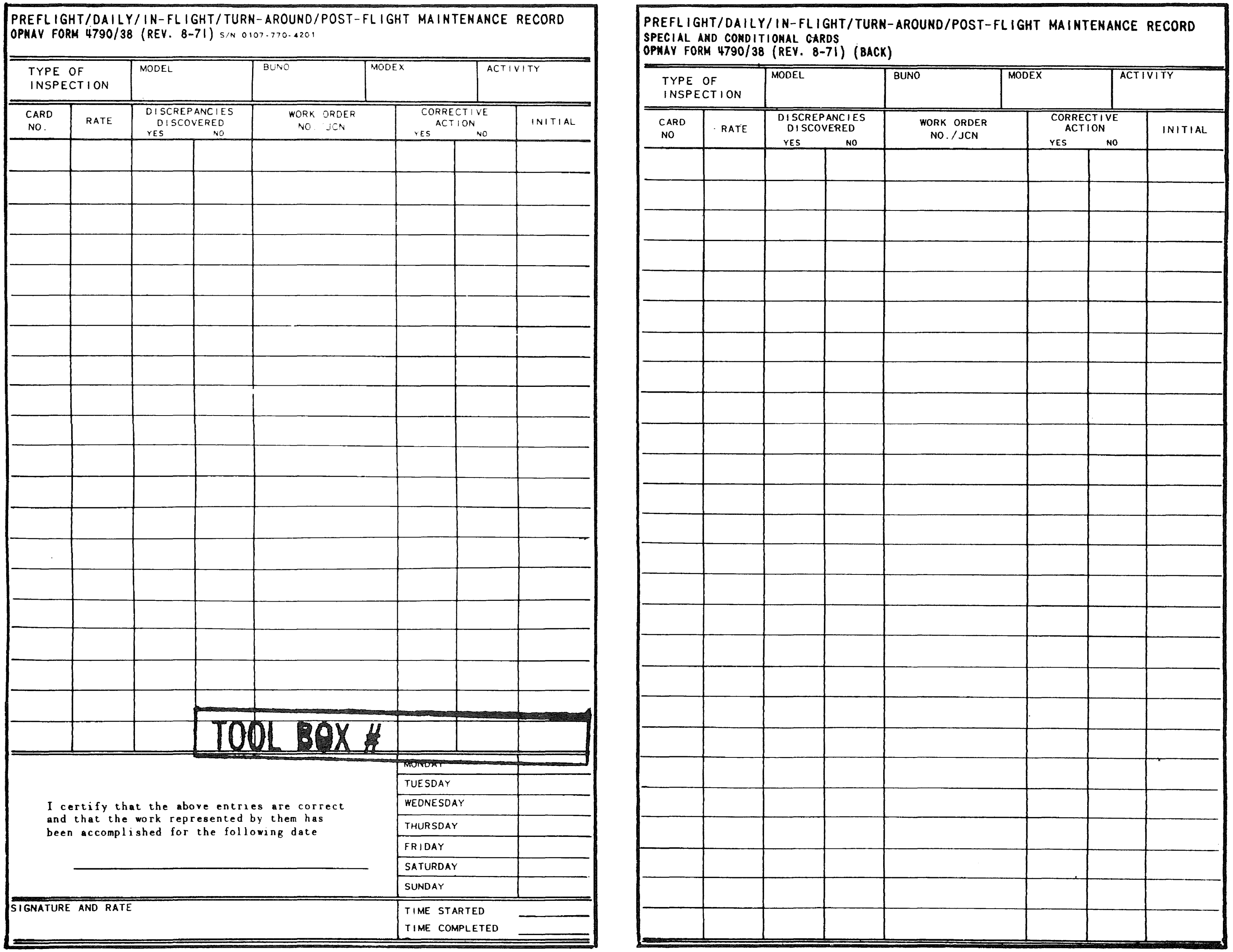
The parachute in the example uses a cartridge actuated device, so you must fill out the appropriate columns on the history card. If the parachute does not use the devices listed, you must use the letters N/A (not applicable) in the column(s). Enter the part number, type of cartridge being used, the time delay of the cartridge, lot number, and the expiration date of the cartridge.

Technical Directives

Since you are placing the parachute into service, you must update its history of technical directives which prescribed changes and modifications and which were previously incorporated. The codes used to properly fill out this part of the history card can be found in appendix K of the OPNAVINST 4790.2 (Series). You also need to use NAVAIR 13-1-6.2 to find a listing of all technical directives that apply to this equipment.

Miscellaneous History

If applicable, you should enter the results of the ripcord pin pull force check for both disassembly and assembly. Notice the Collateral Duty Inspector's (CDI's) initials are entered below each recorded measurement. The CDI's initials shall also be placed in the space following the Suspension Line Mandatory Inspection Point (SLMIP). If applicable, the automatic actuator firing altitude and the results of the spreading gun firing pin pull force check are logged in the proper location. If these checks do not apply, you should enter "N/A". You should enter the Julian date of the last complete inspection and repack, if applicable. If you find these actions are not applicable, enter "N/A". Indicate whether or not



PREFLIGHT/DAILY/IN-FLIGHT/TURN-AROUND/POST-FLIGHT MAINTENANCE RECORD
OPNAV FORM 4790/38 (REV. 8-71) S/N 0107-770-4201

TYPE OF INSPECTION	MODEL	BUNO	MODEX	ACTIVITY

CARD NO.	RATE	DISCREPANCIES DISCOVERED YES	DISCREPANCIES DISCOVERED NO	WORK ORDER NO. JCN	CORRECTIVE ACTION YES	CORRECTIVE ACTION NO	INITIAL

TOOL BOX #

MONDAY
TUESDAY
WEDNESDAY
THURSDAY
FRIDAY
SATURDAY
SUNDAY

I certify that the above entries are correct and that the work represented by them has been accomplished for the following date

SIGNATURE AND RATE

TIME STARTED

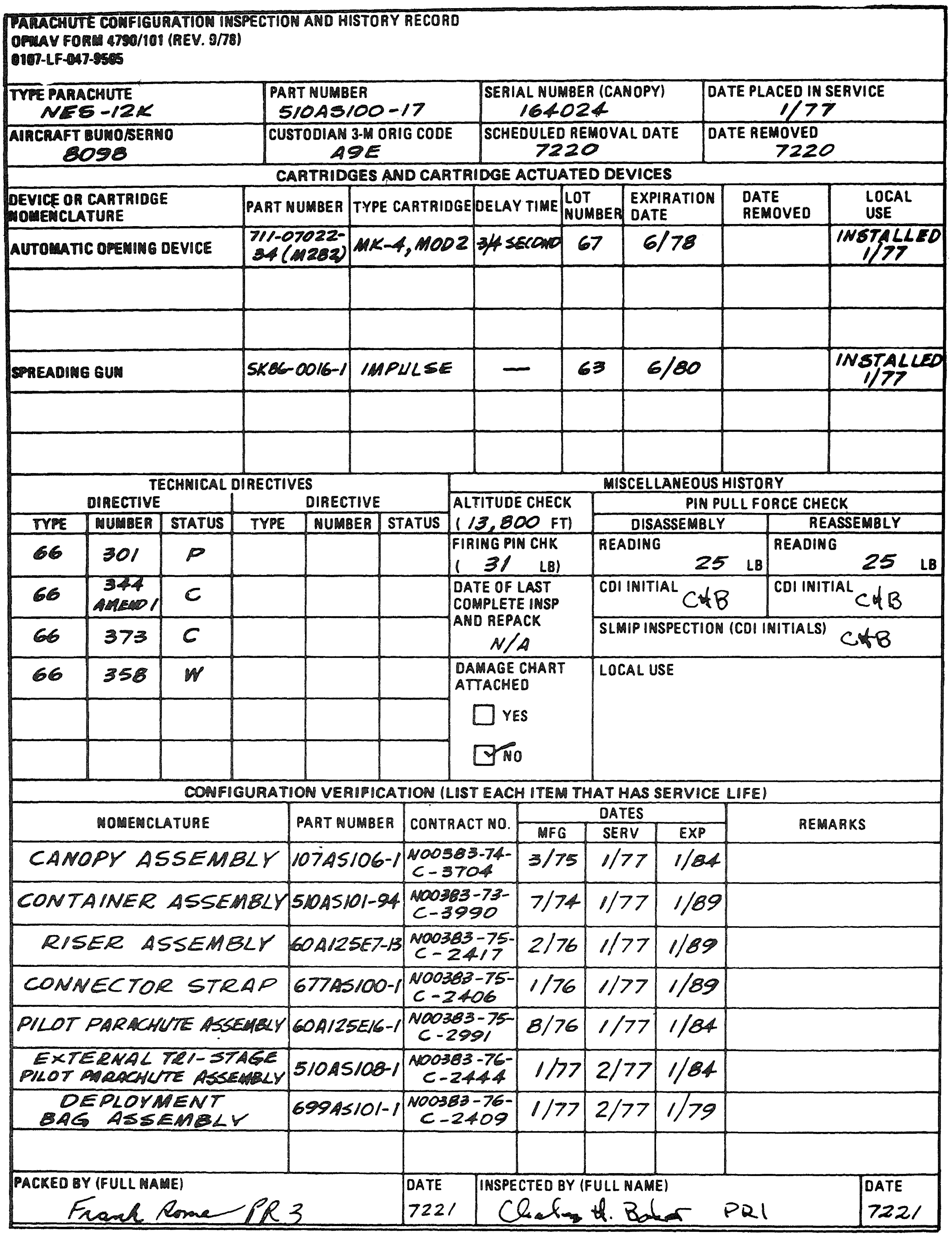
TIME COMPLETED

PREFLIGHT/DAILY/IN-FLIGHT/TURN-AROUND/POST-FLIGHT MAINTENANCE RECORD
SPECIAL AND CONDITIONAL CARDS
OPNAV FORM 4790/38 (REV. 8-71) (BACK)

TYPE OF INSPECTION	MODEL	BUNO	MODEX	ACTIVITY

CARD NO	RATE	DISCREPANCIES DISCOVERED YES	DISCREPANCIES DISCOVERED NO	WORK ORDER NO./JCN	CORRECTIVE ACTION YES	CORRECTIVE ACTION NO	INITIAL

Figure 3-2.—Preflight/daily/inflight/postflight maintenance record.



PARACHUTE CONFIGURATION INSPECTION AND HISTORY RECORD
OPNAV FORM 4790/101 (REV. 9/78)
0107-LF-047-9505

TYPE PARACHUTE NES-12K	**PART NUMBER** 510AS100-17	**SERIAL NUMBER (CANOPY)** 164024	**DATE PLACED IN SERVICE** 1/77
AIRCRAFT BUNO/SERNO 8098	**CUSTODIAN 3-M ORIG CODE** A9E	**SCHEDULED REMOVAL DATE** 7220	**DATE REMOVED** 7220

CARTRIDGES AND CARTRIDGE ACTUATED DEVICES

DEVICE OR CARTRIDGE NOMENCLATURE	PART NUMBER	TYPE CARTRIDGE	DELAY TIME	LOT NUMBER	EXPIRATION DATE	DATE REMOVED	LOCAL USE
AUTOMATIC OPENING DEVICE	711-07022-34 (M282)	MK-4, MOD 2	3/4 SECOND	67	6/78		INSTALLED 1/77
SPREADING GUN	SK86-0016-1	IMPULSE	—	63	6/80		INSTALLED 1/77

TECHNICAL DIRECTIVES

DIRECTIVE			DIRECTIVE		
TYPE	NUMBER	STATUS	TYPE	NUMBER	STATUS
66	301	P			
66	344 AMEND 1	C			
66	373	C			
66	358	W			

MISCELLANEOUS HISTORY

	PIN PULL FORCE CHECK	
ALTITUDE CHECK (13,800 FT)	DISASSEMBLY	REASSEMBLY
FIRING PIN CHK (31 LB)	READING 25 LB	READING 25 LB
DATE OF LAST COMPLETE INSP AND REPACK N/A	CDI INITIAL CHB	CDI INITIAL CHB
	SLMIP INSPECTION (CDI INITIALS) CHB	
DAMAGE CHART ATTACHED ☐ YES ☑ NO	LOCAL USE	

CONFIGURATION VERIFICATION (LIST EACH ITEM THAT HAS SERVICE LIFE)

NOMENCLATURE	PART NUMBER	CONTRACT NO.	DATES			REMARKS
			MFG	SERV	EXP	
CANOPY ASSEMBLY	107AS106-1	N00383-74-C-3704	3/75	1/77	1/84	
CONTAINER ASSEMBLY	510AS101-94	N00383-73-C-3990	7/74	1/77	1/89	
RISER ASSEMBLY	60A125E7-13	N00383-75-C-2417	2/76	1/77	1/89	
CONNECTOR STRAP	677AS100-1	N00383-75-C-2406	1/76	1/77	1/89	
PILOT PARACHUTE ASSEMBLY	60A125E16-1	N00383-75-C-2991	8/76	1/77	1/84	
EXTERNAL TRI-STAGE PILOT PARACHUTE ASSEMBLY	510AS108-1	N00383-76-C-2444	1/77	2/77	1/84	
DEPLOYMENT BAG ASSEMBLY	699AS101-1	N00383-76-C-2409	1/77	2/77	1/79	

PACKED BY (FULL NAME) Frank Rome PR 3	**DATE** 7221	**INSPECTED BY (FULL NAME)** Charles H. Baker PR1	**DATE** 7221

239.462

Figure 3-3.—Parachute configuration inspection and history record.

a canopy damage chart is attached by checking the appropriate box.

Configuration Verification (A list of each item that has a service life)

Refer to NAVAIR 13-1-6.2.1 to determine those components of the assembly that have been assigned a service life. Part numbers and contract numbers of these components are to be logged in appropriate spaces on the history card. Obtain the date of manufacture from the part label and log it on the card. Enter the date placed into service. The service date (date placed into service) is the date that the shipping container seal is broken. An exception to this is when the package is opened to check the contents for a one-time, visual inspection, or to place a technical directive in the package for future reference. The package may then be resealed without affecting the start of service life. An example of a verification of service/total life is shown in figure 3-3.

If the service life has been extended for a particular part, log the identity of the issuing authority and include the date/time/group of the authority message in the REMARKS column.

For subassemblies or components received from supply which are lacking a date of manufacture notation, the date placed in service shall be applied in accordance with the table in NAVAIR 13-1-6.2. This service date shall be the sole factor considered in determining service/total life. Since omission of the date of manufacture is a quality defect, you must submit a Quality Deficiency Report (QDR) whenever this happens.

After the assembly has been completely inspected and repacked and the rigger and CDI are satisfied that the assembly is in a Ready For Issue (RFI) status, both the rigger and the CDI must sign their full names and enter the Julian date at the bottom of the history record.

You have now entered onto the parachute history card the expiration dates and other necessary information about components that have service lives and expiration dates. In future inspections of this parachute assembly, you or other PRs will use this information to check component service life expiration.

Procedures

After the activity has placed the parachute assembly into service and has initiated the Parachute Configuration Inspection and History Card, the card shall be securely attached to the parachute assembly which is then issued to the receiving custodian. The receiving custodian shall review the card and verify that it is complete and accurate in all respects. Any discrepancies in the card shall be resolved prior to the custodian's acceptance of the parachute assembly.

Upon installation of the parachute in an aircraft, the Bureau number of the aircraft shall be entered on the card and the hardback copy shall be forwarded to Maintenance Control for filing in the aircraft logbook. The original (flimsy) copy of the record shall be maintained in a permanent file as designated by the cognizant aircraft maintenance officer. The hardback copy accompanies the parachute any time it is forwarded to the supporting AIMD/IMA for servicing.

The AIMD/IMA fills out a new history card each time it services the parachute assembly. Upon verification of the new record by the receiving custodian the "old" hardback copy may be destroyed.

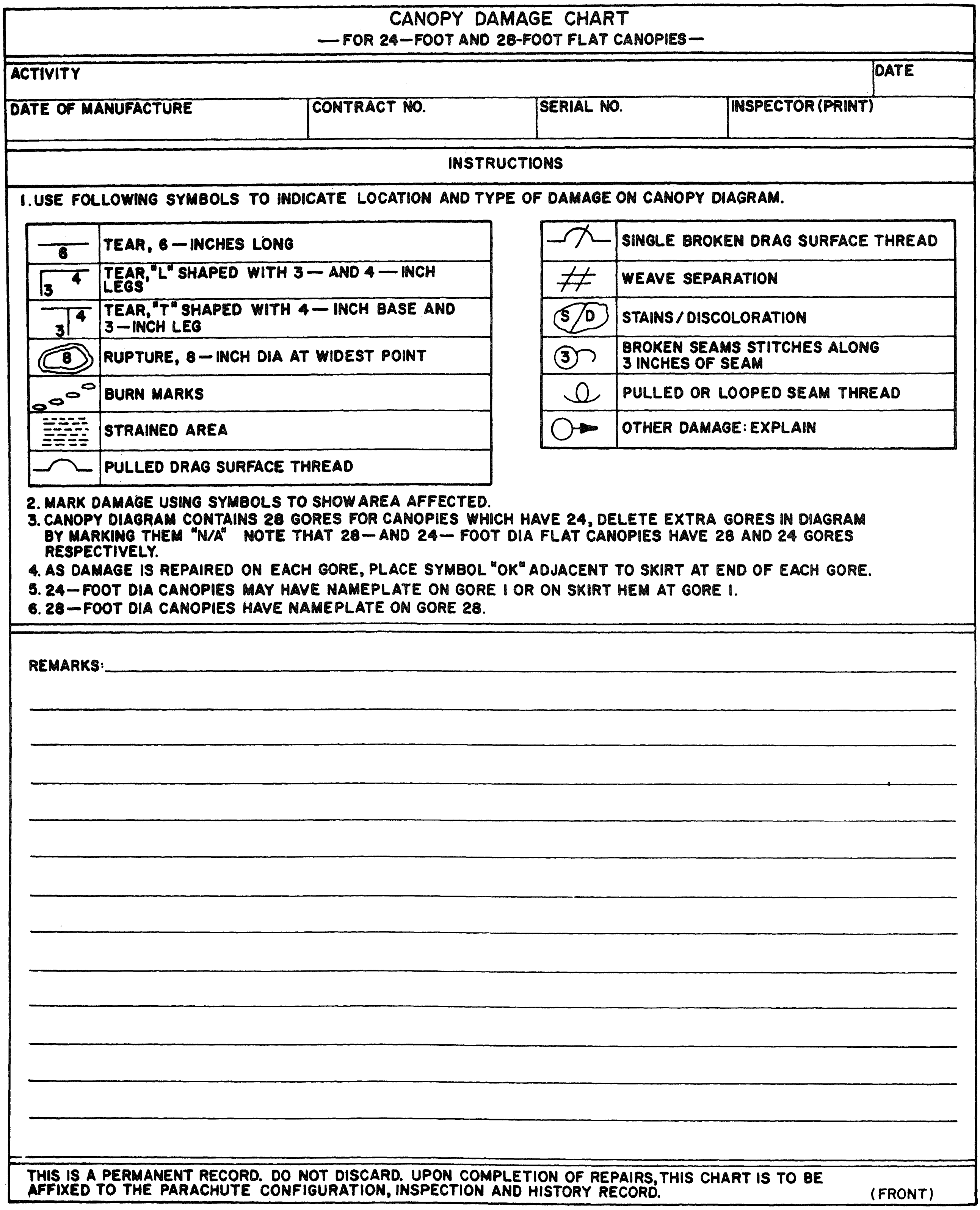
Upon transfer of the parachute, the current hardback copy and all original (flimsy) copies in the permanent file shall be forwarded to the new custodian to provide a complete history of the entire service life of the assembly.

When a parachute has been involved in an aircraft accident, the record shall be forwarded in accordance with OPNAVINST 3750.6 (discussed later).

When a parachute (canopy) has been retired because its total service life has expired, the record may be destroyed. Subassemblies for which the total service life has not expired may be salvaged for future use. Appropriate service life information is transcribed to an Aircraft Equipment Condition Tag (NAVAIR-2650) and attached to the salvaged items if they are to be reused. Under no circumstances shall a salvaged item be reused if its previous history cannot be firmly established.

CANOPY DAMAGE CHARTS

Whenever a canopy is inspected and found to need repairs, an appropriate Canopy Damage Chart shall be filled out. An example of this chart is shown in figure 3-4. The symbols to be used are shown on one side of the chart. As each defect is repaired, you write "OK" in the section



CANOPY DAMAGE CHART
—FOR 24—FOOT AND 28-FOOT FLAT CANOPIES—

ACTIVITY			DATE
DATE OF MANUFACTURE	CONTRACT NO.	SERIAL NO.	INSPECTOR (PRINT)

INSTRUCTIONS

1. USE FOLLOWING SYMBOLS TO INDICATE LOCATION AND TYPE OF DAMAGE ON CANOPY DIAGRAM.

6	TEAR, 6—INCHES LONG
3 4	TEAR, "L" SHAPED WITH 3— AND 4—INCH LEGS
4 3	TEAR, "T" SHAPED WITH 4—INCH BASE AND 3—INCH LEG
8	RUPTURE, 8—INCH DIA AT WIDEST POINT
	BURN MARKS
	STRAINED AREA
	PULLED DRAG SURFACE THREAD

	SINGLE BROKEN DRAG SURFACE THREAD
#	WEAVE SEPARATION
S/D	STAINS / DISCOLORATION
3	BROKEN SEAMS STITCHES ALONG 3 INCHES OF SEAM
	PULLED OR LOOPED SEAM THREAD
	OTHER DAMAGE: EXPLAIN

2. MARK DAMAGE USING SYMBOLS TO SHOW AREA AFFECTED.
3. CANOPY DIAGRAM CONTAINS 28 GORES FOR CANOPIES WHICH HAVE 24, DELETE EXTRA GORES IN DIAGRAM BY MARKING THEM "N/A" NOTE THAT 28—AND 24—FOOT DIA FLAT CANOPIES HAVE 28 AND 24 GORES RESPECTIVELY.
4. AS DAMAGE IS REPAIRED ON EACH GORE, PLACE SYMBOL "OK" ADJACENT TO SKIRT AT END OF EACH GORE.
5. 24—FOOT DIA CANOPIES MAY HAVE NAMEPLATE ON GORE 1 OR ON SKIRT HEM AT GORE 1.
6. 28—FOOT DIA CANOPIES HAVE NAMEPLATE ON GORE 28.

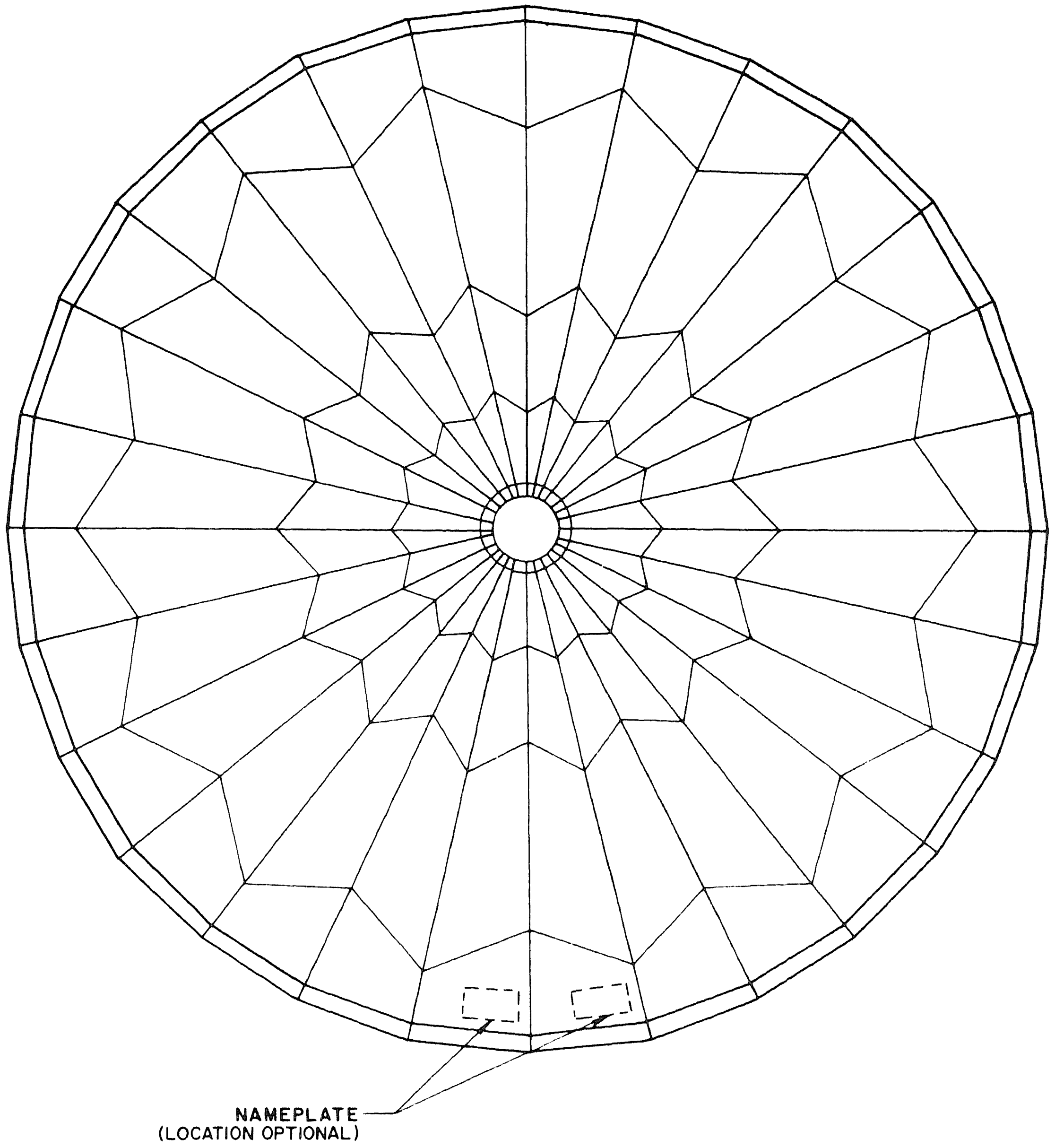
REMARKS: ______________________________

THIS IS A PERMANENT RECORD. DO NOT DISCARD. UPON COMPLETION OF REPAIRS, THIS CHART IS TO BE AFFIXED TO THE PARACHUTE CONFIGURATION, INSPECTION AND HISTORY RECORD. (FRONT)

Figure 3-4.—Canopy damage chart for 24- and 28-foot diameter canopies (sheet 1).

CANOPY DAMAGE CHART (REAR)

CANOPY DIAGRAM (TOP VIEW)



THIS IS A PERMANENT RECORD. DO NOT DISCARD. UPON COMPLETION OF REPAIRS, THIS CHART IS TO BE AFFIXED TO THE PARACHUTE CONFIGURATION, INSPECTION AND HISTORY RECORD.

Figure 3-4.—Canopy damage chart for 24- and 28-foot diameter canopies (sheet 2 of 12).

representing the respective gore. If repairs cannot be made locally, the chart goes with the canopy to the next higher level maintenance activity. This form shall not be discarded. When the repairs are done, the Canopy Damage Chart is attached to the Parachute Configuration, Inspection, and History Record.

NAVAL AVIATION MAINTENANCE PROGRAM FORMS

The following forms used in the Naval Aviation Maintenance Program (NAMP) are applicable to parachute maintenance: VIDS/MAF Form, Support Action Form, and Work Request Forms. Proper completion of documents is essential to the function of the program. Detailed instructions on their use may be found in the *Naval Aviation Maintenance Program Manual*, OPNAVINST 4790.2 (Series).

RECORDING MODIFICATIONS

When a modification is performed on a parachute assembly, you shall record the assigned Technical Directive Code and Modification Code on the Parachute Configuration, Inspection and History Record. Other records shall be completed in accordance with OPNAVINST 4790.2 (Series).

INSPECTIONS

The various times at which inspections are performed on personnel parachutes are discussed in the following paragraphs.

DAILY INSPECTION

A daily inspection should be performed on all in-service parachute assemblies either installed in aircraft or in ready issue rooms. The inspection may be accomplished by line personnel, or by an issue room custodian who has been checked out by both the AME and PR shops and found qualified. The inspection is performed in accordance with the maintenance requirement card (MRC) for the equipment and the requirements detailed in NAVAIR 13-1-6.2 for the aircraft involved. It is done before daily flight operations and is a visual in-place inspection. It is also included in the special (seven/fourteen day) inspection.

The packaged parachute is inspected for external evidence of damage. You should be looking for wear or other evidence of physical abuse. The assembly should also be checked for stains which may indicate contact with harmful fluids or chemicals. Any stain should be considered harmful until the fluid that made it is identified. Stains or discolorations may also be caused by contact with a hot object. Heat can seriously weaken the synthetic fabrics in parachute assemblies. Another possible source of trouble is exposure to ultraviolet radiation such as sunlight or some types of artificial lighting. Any evidence of damage or suspicious condition must be reported to maintenance control.

SPECIAL (SEVEN/FOURTEEN-DAY) INSPECTION

The special inspection is performed at intervals of seven or fourteen days. As stated earlier, parachutes in the A-7 aircraft are an exception. They are inspected every ten days. In-service parachute assemblies installed in aircraft and in ready issue rooms are also given this special inspection. This inspection includes the integrated torso harness and quick attachable harnesses. The daily inspection is included as part of performing the special inspection. Assemblies used for training, parachute rescue, pathfinding, and reconnaissance teams, and those parachute assemblies not assigned to a specific type of aircraft are inspected every fourteen days. It is done by organizational level maintenance PR personnel, such as yourself and conducted only under adequate lighting conditions.

This inspection includes, but is not limited to, emergency aircraft escape assemblies and/or systems, as well as assemblies used for premeditated free-fall or static line parachute descents. The reserve (emergency) parachute which may form a part of a training-type, troop-type, or a test assembly is also inspected. Parachute assemblies are not opened for the special inspection or for the daily inspection. If you find or suspect any damage or contamination, notify maintenance control. When you complete the special inspection, enter your full name, rate, and current date on the Preflight/Daily/In-Flight/Postflight Maintenance Record Card.

ACCEPTANCE (ORIGINAL ISSUE) CALENDAR/PHASED/CONDITIONAL INSPECTIONS

These inspections are major inspections conducted at the times suggested by their titles. They are to be done at the lowest level of maintenance that has the capability. With the exception of the acceptance inspection, these are major inspections of all the components of the parachute assembly and require unpacking and repacking the parachute. Therefore, quality assurance steps to be taken by a Collateral Duty Inspector (CDI) are provided for all critical items. These are indicated on the Shop Process Cards, and separate cards are provided for the CDI. In the list of procedures for this inspection in the *Personnel Parachute Manual*, NAVAIR 13-1-6.2, the quality assurance items are identified by underlining. In this text we follow that format. When the parachute rigger reaches an underlined step he performs it and then has his performance verified by the CDI. In no case may a person who performed the work perform his own quality assurance inspection. The following paragraphs explain when acceptance and periodic inspections are made.

Original Issue/Acceptance

The original issue/acceptance inspection is performed when the parachute is placed into service or "inducted". It is the same as the calendar/phased inspection, but includes preparing the Parachute Configuration, Inspection, and a new History Record.

Some parachutes are received as part of the inventory of a newly acquired aircraft. If the parachute has already undergone an original issue inspection, it needs only to be visually inspected without unpacking and its accompanying records reviewed for discrepancies or missing information. If any discrepancies are found, the parachute shall undergo a calendar inspection.

Calendar/Phased

The calendar/phased inspection is a periodic inspection which is scheduled to correspond with the inspection and maintenance cycle of the aircraft to which the parachute is assigned. The inspection interval does not exceed 217 days (31 weeks) with the following exceptions:

1. Parachute NES-19A is inspected at least every 540 days.
2. Parachute NES-12 (in S-3 aircraft) is inspected at least every 224 days.
3. Parachute NC-3 (in C-130 aircraft) is inspected at least every 224 days.
4. Parachutes NSP-1, NSP-2, and NSP-3 are inspected at least every 182 days.

Shop spare parachutes are inspected at least every 217 days. To maintain the coordination between the periodic inspections and the aircraft maintenance schedule, be sure that shop spares are not issued when they have a repack cycle that will expire before the aircraft is due for inspection.

To meet unusual situations and facilitate workload scheduling, the inspection may be done within a week of the specific date. Necessary additional days may be added to enable a ferry flight to return to its home station/ship. However, in each instance deviations shall apply only to the immediate inspection. If unusual circumstances dictate deviations from succeeding inspection dates, each shall be computed from the date on which the inspection would have been due regardless of the preceding deviation.

NOTE: This does not mean that if an aircraft has a check cycle of less than 217 days (i.e., C-121 parachutes, 13-week inspection interval) that the parachute inspection can be extended to 217 days. In this example, the C-121 parachutes would be inspected every 182 days.

Conditional Inspection

When a parachute assembly must be inspected as the result of a specific situation or set of conditions unrelated to the normal inspection interval, a conditional inspection shall be performed.

indicate excess alkalinity. By following the steps listed below, you will be able to conduct a proper inspection to determine if a stain is acid or alkaline. You need to have distilled water and a pH Test Paper Kit (Full Range and Short Range).

CAUTION: Make sure that the testing area is free of contaminants to avoid false readings or damage to the assembly.

In order to perform an acid and alkaline contaminant inspection properly, you:

1. First dampen the suspected area with distilled water.
2. Place a piece of full range test paper (0.0 to 14.0 pH) on the dampened area. Compare the color of the paper with the chart samples to determine the approximate pH and which specific short-range test paper to use.
3. Place the short-range test paper indicated by step 2 on the dampened area. The color the paper changes to will indicate the pH factor of the affected area. By matching the test strip with the applicable range color chart supplied with pH indicator kit, you can determine the strength of the acid or alkaline present.

NOTE: You must be careful not to let the suspected contaminated area come into contact with any other area, as this could spread the damage.

4. Treat contaminated areas of the parachute assembly in accordance with NAVAIR 13-1-6.2.

Other Contaminations

Those stains caused by contact with acid, oil, and salt water are the most harmful to nylon and should be removed as quickly as possible to prevent further deterioration of the material. Although sun rays do not stain, they are most harmful to nylon. Parachutes and components must be kept out of the direct sunlight.

INSPECTING FOR WEAR AND PHYSICAL DEFECTS

Wear in a parachute is not difficult to detect. Chafing at the corners or on outside surfaces is where the most wear occurs. Parts of parachutes and related equipment showing excessive wear should be replaced or repaired, the work to be accomplished at the lowest maintenance level capable of performing the task.

PILOT PARACHUTE INSPECTION

Inspect the fabric drag surfaces, rib pockets, lift webs, seams and suspension lines for signs of contamination, cuts, tears, burns, fraying and loose or missing stitches. Inspect the vane material for defects and deterioration. Inspect for seam separation along the seam area where the vane attaches to the cone and suspension lines. Yarn separation is acceptable; however, replace the pilot chute if the vane material contains holes, rips or tears. Inspect the spring assembly for sufficient tension and bends. Replace all loose or broken tackings. There is little that you can repair on a pilot parachute. If any damage is found, you must replace the pilot parachute in accordance with NAVAIR 13-1-6.2.

Canopy Inspection

Inspecting the canopy requires the most time. You must take your time in order to be certain that you don't miss any defects. NAVAIR 13-1-6.2 spells out the step-by-step procedures for this inspection. Any damage must be recorded on a canopy damage chart. (See figure 3-4.) To inspect the canopy for possible defects or damage, you should:

1. Lay the canopy on a clean packing table so its nameplate gore is facing down.
2. Place tension on the canopy.
3. Your helper raises the suspension line. Use Y-stands at the skirt hem to hold the suspension lines.
4. You, as the packer, start at the skirt hem and inspect the upper radial seam from skirt hem to peak. You inspect the vent hem, collar and ring, lower radial seam, fabric surface, diagonal seams or tapes, and skirt hem. Minor defects which do not weaken the assembly shall not be reported on a canopy damage chart. If necessary, minor defects may be corrected by light brushing or trimming.

5. Significant damage and major defects such as holes, rips, tears, or contaminated areas that have to be removed, shall be reported on the canopy damage chart.

Use the same procedure to inspect all canopy gores.

SUSPENSION AND VENT LINE INSPECTION

To inspect the suspension lines, you and your helper grasp one group of suspension lines at the connector links and walk toward the canopy skirt hem, allowing the lines to run freely over the palm of your hand. Visually examine the lines for damage and defects. Upon reaching the skirt hem, grasp the remaining groups of lines and inspect them the same way, walking toward the connector links. The lines at the canopy vent are also visually examined. Your inspection includes, but is not limited to the following:

1. General condition of the suspension lines including: fraying, ruptures, inner cores protruding from lines; dirty, lumpy, hard or thin spots; friction burns; improper overlap length; presence of twists in individual lines; and the proper sequence of lines on the connector links. To help you decide on the various types of damage, see the examples in figures 3-5 and 3-6.

2. Be sure that each of the suspension lines is in proper rotation at the connector links and through the canopy.

3. On an Original Issue Inspection, you must measure the suspension lines for proper length. Apply a 20-pound tension to each line. The length of the shortest line and the length of the longest line must not vary more than two inches.

4. Inspect the attachment at the skirt hem for thin spots at the V-tabs; also check the condition of the V-tabs.

5. Inspect the Four Line Release System. (The four line release system permits four of the suspension lines on one side of the parachute to be detached from the connector links during a parachute descent. This permits the parachutist to damp oscillations and to have some control

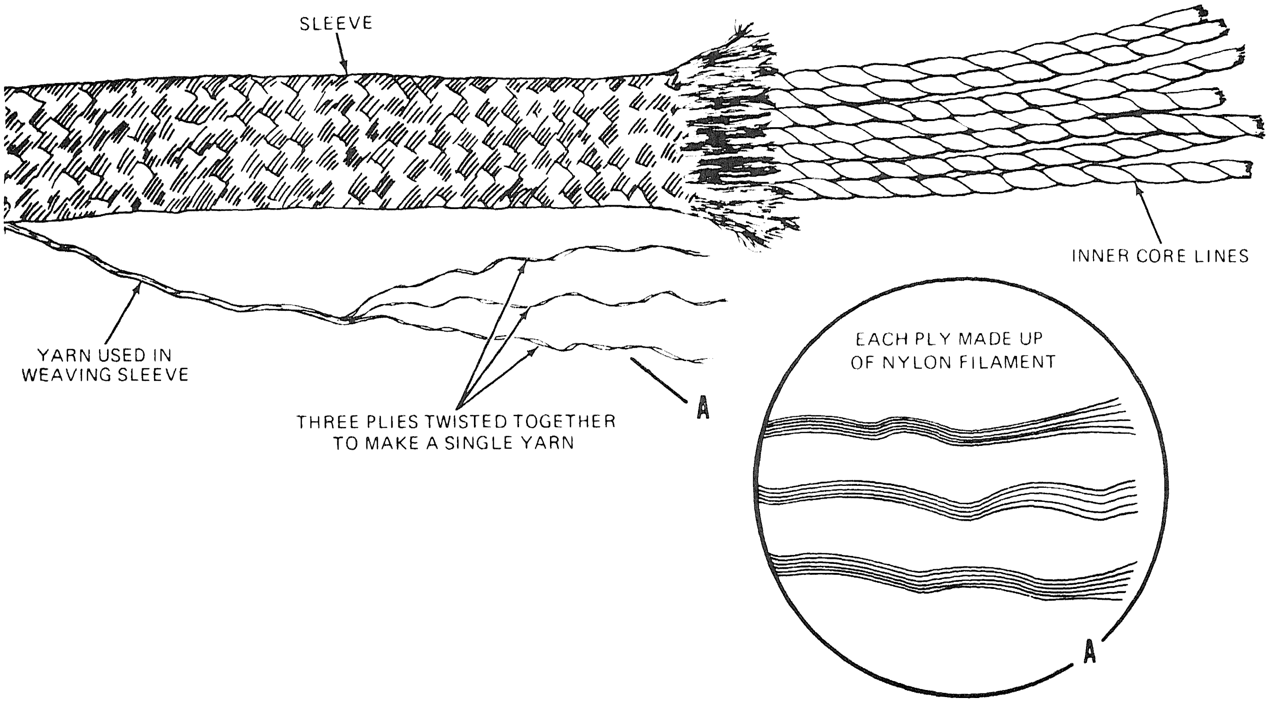
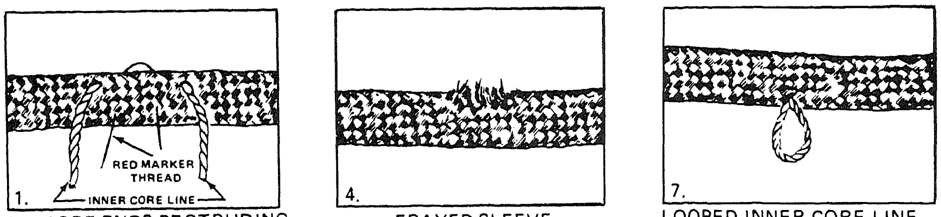

SLEEVE
INNER CORE LINES
YARN USED IN WEAVING SLEEVE
THREE PLIES TWISTED TOGETHER TO MAKE A SINGLE YARN
A
EACH PLY MADE UP OF NYLON FILAMENT
A

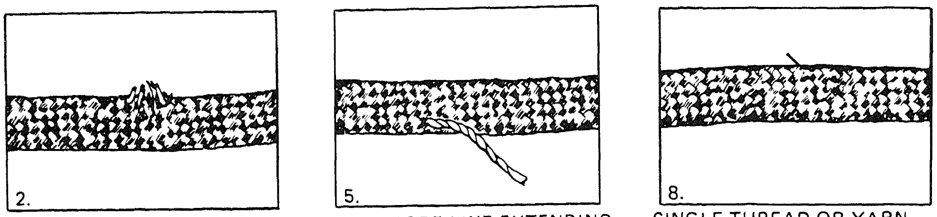
Figure 3-5.—Suspension line construction.



TWO CORE ENDS PROTRUDING THROUGH SLEEVE.

FRAYED SLEEVE

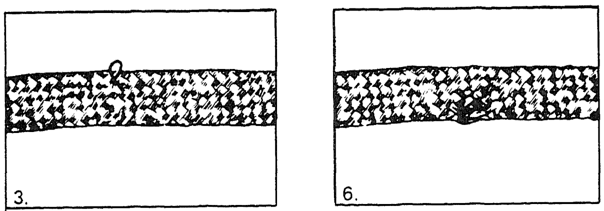
LOOPED INNER CORE LINE–NO DAMAGE TO SLEEVE.



RUPTURE

SINGLE CORE LINE EXTENDING.

SINGLE THREAD OR YARN MATERIAL EXTENDING FROM SLEEVE.



LOOPED PULLED THREAD IN SLEEVE.

MINOR WEAVE SEPARATION TO SLEEVE.

Figure 3-6.—Suspension line damage.

over the direction the parachute travels when descending.)

6. Other defects should be noted on the Parachute Configuration, Inspection and History Card. If a defective line is found which would affect the safe operation of the assembly, the line must be replaced at a depot level maintenance activity.

CONNECTOR LINK INSPECTION

To inspect connector links, you should proceed as follows:

1. First, examine the connector links for proper part numbers, signs of corrosion, distortion, bends, dents, nicks, burrs, sharp edges, breaks, and if applicable, defective yoke and plate assemblies.
2. If required, examine the yoke and plate assembly for proper installation (see figure 3-7). When the yoke and plate assembly screw is tightened, there shall be a maximum of 1/64-inch play in the assembly. (To tighten the screw use a torque of 20 to 25 inch-pounds.)

At this point, a mandatory inspection is performed by a Collateral Duty Inspector. All of your work stops until the mandatory inspection is performed and the assembly has been found acceptable.

BALLISTIC SPREADING GUN INSPECTION

While inspecting the ballistic spreading gun, you may have to remove, replace, or make some adjustment. All work must be in accordance with the procedures in the applicable chapter of the NAVAIR 13-1-6.2. The ballistic spreading gun is described in the next chapter of this text.

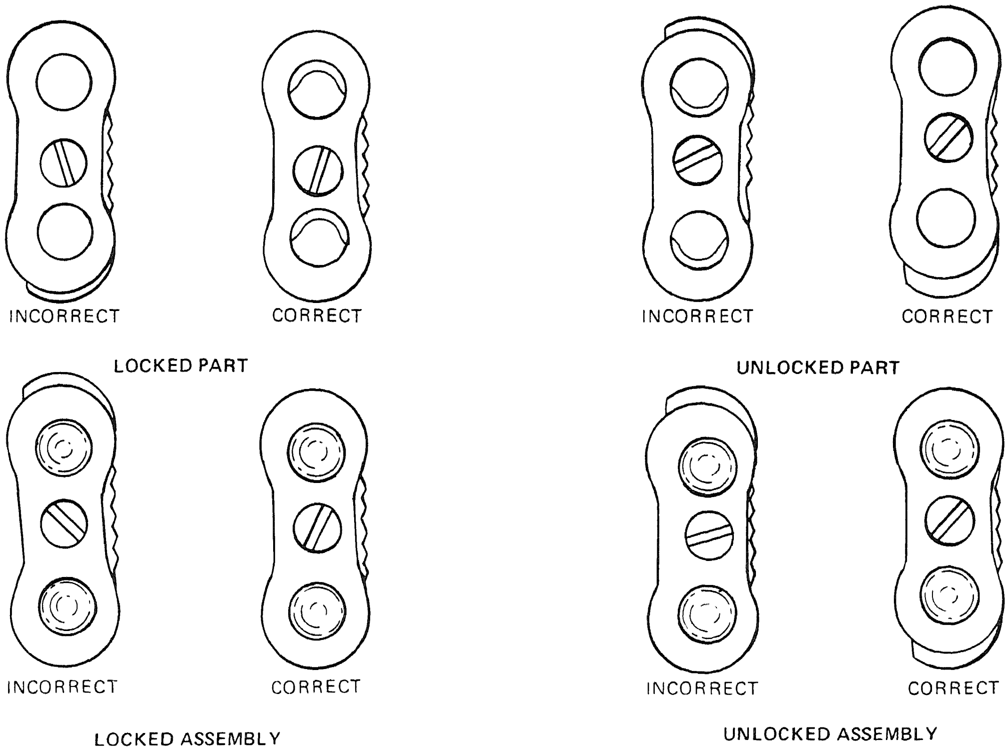


Figure 3-7.—Locked and unlocked connector links.

HARNESS/RISER ASSEMBLY INSPECTION

Inspect the harness webbing for signs of contamination from oil, grease, acid or other foreign matter, such as rust at points of contact with metal parts. Inspect for cuts, twists, fading, excessive wear or fusing (indicated by unusual hardening or softening of webbing fibers), fraying, burns, abrasions and loose or broken stitching (in excess of three stitches). If applicable, inspect the four-line-release lanyard flute for wear and proper attachment. If you find any damage to the harness, dispose of it and replace it in accordance with applicable rigging and packing procedures.

When a replacement harness is installed you should stencil the date, preceded by the letter "R", in the center of the horizontal back strap in letters 1/2-inch high. For example, "R-2-80" indicates a replacement was made in February 1980.

If fewer than three stitches are loose or broken, repair the riser or harness assembly by using nylon 6-cord, lock-stitch over original stitch and 3/4 inches on both sides of the original. Use 4 to 6 stitches per inch.

Hardware Inspection

To inspect harness and riser hardware, proceed as follows:

1. Inspect the canopy quick-release fittings for breaks, corrosion, pitting, bends, dents and sharp edges. Check the tamper-dot on the locking screw. If it is broken, tighten it and apply a new tamper-dot to the screwhead using lacquer (TT-L-32, 11136, insignia red) or equivalent. Remove sand or any dirt from the mechanism using an air hose to blow it out at not more than 50 psi pressure. Wipe dirt and grease from fittings with a clean rag. Do not lubricate the fittings. Replace all damaged fittings.
2. With the canopy quick-release fitting locking cover plate held in the open position, insert a torque meter into the hexagonal cavity

located on either end of the knurled locking-lever shaft. With the canopy quick-release fitting locking cover plate held in the open position, rotate the knurled lever shaft until it reaches the stop. Record the torque reading. The allowable torque is 28 to 42 ounce-inches. All canopy quick-release fittings that do not meet torque test requirements shall be replaced.

3. Inspect all other hardware for signs of corrosion, pitting, ease of operation, security of attachment, bends, dents, nicks, burrs and sharp edges. Make sure that the rollers in the roller yokes turn freely. If you find any parts damaged, forward the riser or harness assembly to Supply for screening.

NOTE: Hardware that has been rejected is forwarded to the Commanding Officer, National Parachute Test Range, China Lake, California, Attention: Code END, 4.

Cross-Connector Strap Inspection

Inspect the cross-connector strap(s) for signs of contamination, cuts, fraying, burns and loose or broken stitching. If you find any damage, dispose of them locally and replace them in accordance with applicable rigging and packing procedures.

RIPCORD ASSEMBLY INSPECTION

The ripcord was inspected before the parachute was unpacked. Now it is inspected again. To inspect the ripcord assembly, examine the following:

1. Inspect the ripcord handle. Examine the cable and locking pins for signs of corrosion, bends, dents, cracks, loose swage joints, and breaks. If damaged, dispose of it locally.

2. Inspect the ripcord housing for signs of corrosion, bends, dents, and for security of attachment. If any damage is found, replace the housing.

3. Inspect the ripcord housing release clamp and base plate for signs of corrosion, bends, dents, cracks and security of attachment.

4. Inspect the ripcord housing release lanyard and guide for signs of contamination, tears, fraying, loose or broken stitches, cuts, burns, correct length and security of attachment.

5. If you find any loose or damaged tackings they must be replaced.

Ripcord Handle Pocket Inspection

Inspect the ripcord handle pocket for signs of contamination, cuts, tears, burns, fraying and loose or broken stitches. If such damage is found, the pocket is replaced. You have an option on how the new pocket can be installed. You may install a new pocket by machine stitching, using nylon thread, size E (V-T-295), or by whip stitching, using waxed nylon 6-cord, Type I, doubled, stitches being 3/8-inch apart.

Ripcord Handle Clip Inspection

To inspect the ripcord handle clip, you:

1. Examine the clip for corrosion, sharp edges, bends, twists, and dents. Examine the webbing for contamination, fraying, loose or broken stitching, cuts and burns. Replace any damaged stitching. If other damage exists, replace webbing and/or clip.

2. If any maintenance is performed on the clip, repeat the pull-force test outlined in NAVAIR 13-1-6.2 and described earlier in this chapter.

CONTAINER ASSEMBLY INSPECTION

When you inspect the container assembly, examine all flaps, locking cones, and grommets, spring opening bands, and tackings; checking fabric, seams, reinforcement, and hardware. Check fabric, seams, webbing and reinforcement for holes, cuts, tears, fraying, contamination, and deterioration. Examine hardware for corrosion, bends, dents, nicks, sharp edges, proper function, and security of attachment. Make sure that you keep a record of any damage for later repairs. Repair holes, tears, snags, or rips in container fabric using approved procedures as described in NAVAIR 13-1-6.2.

Some parachute containers use rubber retaining bands to secure the suspension lines. On most assemblies these rubber bands must be replaced at each repack regardless of their condition. There are two types of rubber bands which are allowed under the standard MIL-B-1832. Type I has a service life of 3 years and type II has a service life of 5 years. (Service life is determined as from the date of manufacture.)

COMPLIANCE WITH CURRENT DIRECTIVES

On parachute repack cycles, or when otherwise directed, inspect the parachute assembly and components for updating and with meeting the latest modifications. For each type of parachute, refer to the *Aviation-Crew Systems Personnel Parachute Manual*, NAVAIR 13-1-6.2 and recent Aircrew System Bulletins and changes for all current parachute configurations. Do not permit any local modifications without prior approval by proper authority.

CHAPTER 4

AUTOMATIC OPENING DEVICES

As you look around the parachute loft, you will see that it is a very clean, neat, and safe looking place to work. Although it has this appearance, there are a few places there that are very dangerous. One of these more hazardous places is the packing table. The packing table may look as safe to you as sitting at home in your easy chair watching T.V. However, on the packing table you will find the automatic opening devices. There are two basic opening devices used in the operation of personnel parachutes.

The first is the automatic actuator. Working with this actuator is the same as working with a loaded .38 caliber pistol. The second is the ballistic spreader gun. This gun has a cartridge, and when fired gives the same effect as an exploding hand grenade. Working with any opening device requires extreme caution and all safety precautions must be taken to ensure your safety as well as that of your coworkers. The chapter you are about to read will help you understand the operation, function, and maintenance of this equipment.

AUTOMATIC PARACHUTE ACTUATORS

The Navy currently uses the model 7000 Automatic Actuator (figure 4-1) in its personnel parachute assemblies. It is a barometrically controlled, pyrotechnic device. The actuator is designed to open a parachute at a preset altitude. The model 7000 Automatic Actuator is available with two different altitude settings. One is the 10,000-foot setting, plus or minus 1000 ft (identified by green labels on the cover assembly. The aneroid is identified by a green potting seal and a white label with green lettering.) The other is the 14,000-foot setting, plus or minus 1000 ft (identified by red labels on the cover assembly. The aneroid is identified by a red potting seal and a white label with red lettering.)

FUNCTION

It is impossible for an aircrewman to select the altitude at which an emergency may occur. By using the automatic actuator you can bring the aircrewman down to a safe altitude before the parachute opens.

When an aircrewman makes an emergency ejection at an altitude above that for which the actuator is set to open the parachute, the following functions take place:

1. The arming pin is pulled. This pin locks the actuator firing mechanism while installed. When the arming pin is withdrawn, the assembly fires at or below the preset altitude of the actuator.
2. The sear and the aneroid mechanism lock the actuator.
3. As the aircrewman free-falls, increasing air pressure causes the aneroid to contract.
4. As the operating altitude is reached, the aneroid contracts enough to remove the sear from the firing hammer lock.
5. The hammer's firing pin strikes the cartridge.
6. The time-delay cartridge fires (time depending on the type of cartridge used) after the hammer strikes.
7. The piston is forced forward in the barrel, pulling the power cable, which is attached to the parachute locking pins. (The power cable travels 3.75 inches.)
8. The locking pins are pulled and the normal parachute opening sequence begins.

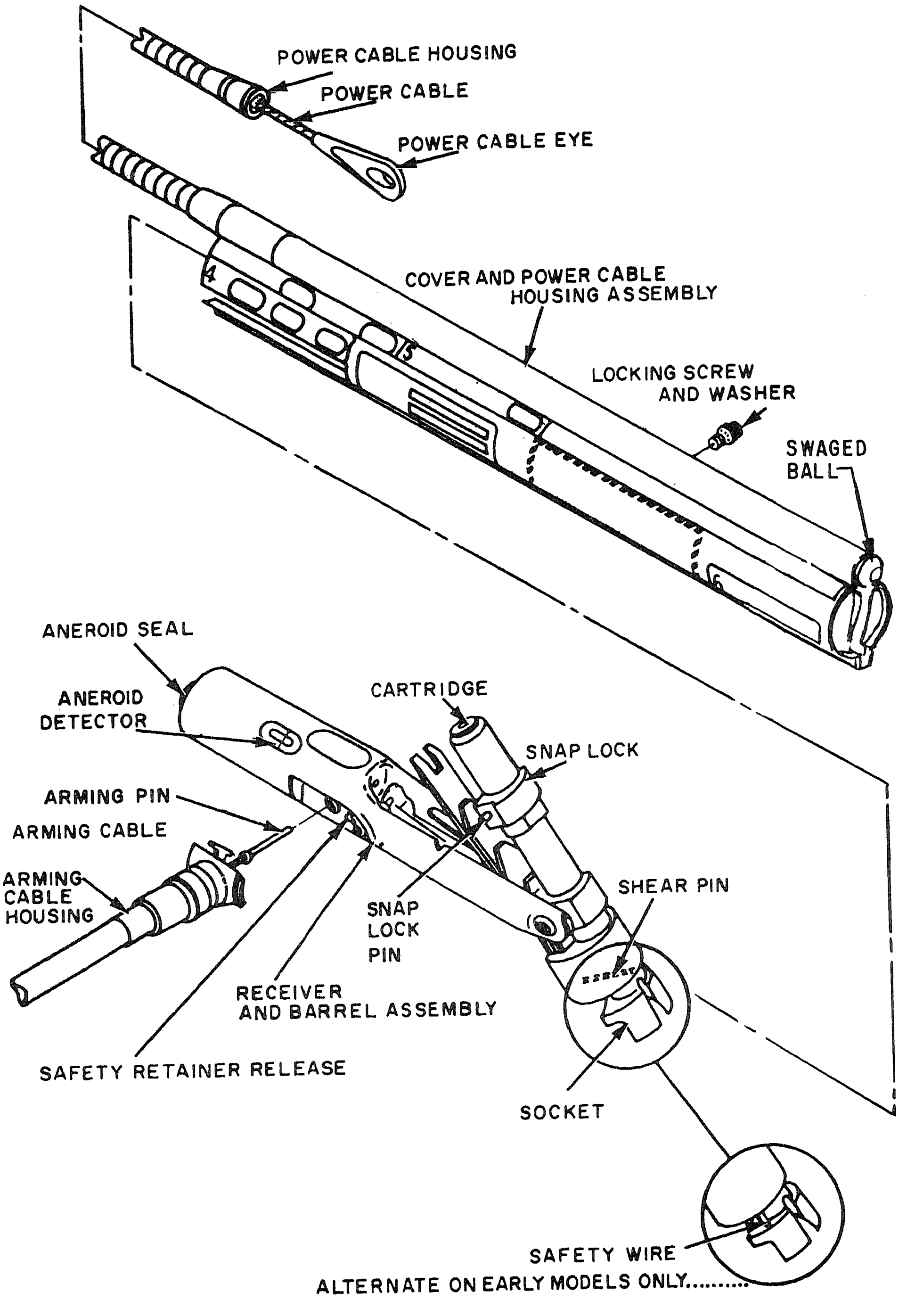


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Figure 4-1.—Model 700 automatic actuator.

When an aircrewman bails out below the operating altitude of the automatic actuator, the hammer releases as soon as the arming pin is pulled, and the following functions take place:

1. The hammer's firing pin strikes the cartridge.

2. The time delay cartridge fires (time depending on the type of cartridge used) after the hammer strikes.

3. The piston is forced forward in the barrel, pulling the power cable, which is attached to the parachute locking pins.

4. The locking pins are pulled and the normal parachute opening sequence begins.

PREPARATION FOR USE

When you receive an actuator from supply, there are some preparations for you to make before placing it into service. Upon removal of the actuator from the shipping carton, the exterior parts of the unit must be inspected for damage during shipping and storage. An inspection should be made for corrosion, dirt, dents, and cracks. If any damage or discrepancy is found, a quality deficiency report shall be submitted and a tag must be affixed to the actuator stating that the actuator is not to be used. Remove this tag only after correction has been made. Fired actuators must not be reused.

All Model 7000 actuators that fail any inspection points must have a tag affixed stating the nature of the defects.

NOTE: The cartridge service life is 5 years from the date of manufacture or 18 months after opening of the original package, whichever occurs first. The cartridge service life must not expire prior to the next scheduled repack of the parachute assembly.

WARNING: Exercise extreme caution when handling automatic actuators after the cartridge has been inserted in the barrel. Do not allow either end of the cover assembly to be pointed toward the face as high velocity flame and smoke may be produced if the cartridge goes off. Another reason for extreme caution is the possibility that the piston of the actuator may become a projectile if the cartridge accidentally fires.

An automatic actuator in service must be inspected each time its parachute assembly is repacked. You must pay particular attention to detail when working on an actuator. The importance of careful work must be impressed upon personnel actually performing the work, as well as those assigned to collateral duty inspections. You will find more detailed information concerning automatic actuators in the *Aircrew Systems Manual, Personnel Parachutes*, NAVAIR 13-1-6.2.

MAINTENANCE

Maintenance on any automatic actuator in service shall be performed each time its parachute assembly is repacked. Maintenance shall consist of the following:

Disarming

Inspection

Firing Altitude Check

Arming and Assembly

Checkout of Armed Actuator

As you work on an actuator, you are required to perform several different types of maintenance and inspections. You are required to inspect the operational condition of the actuator before installing it in a parachute assembly. If you find any damage or an inspection discrepancy, submit a Quality Deficiency Report, as discussed in OPNAVINST 4790.2 (Series).

NOTE: Under no circumstances shall an unsatisfactory actuator be installed.

The first step in performing the normal inspection maintenance on an actuator is to disarm it. Then you are ready to inspect and perform the firing altitude checks.

DISARMING

Anytime you are required to disarm an actuator follow the procedures outlined in NAVAIR-13-1-6.2. The discussion which follows closely parallels those procedures. A parts breakdown can be seen in figure 4-1.

NOTE: To remove the arming cable housing from the actuator, depress the safety retainer release (figure 4-1). NEVER try to remove the arming cable from an armed actuator assembly by pulling on the cable. This fires the actuator.

1. Open the actuator pocket and remove the actuator only a sufficient distance to allow disassembly.

2. Remove the locking screw and washer.

NOTE: The cover and power cable housing assembly and the receiver and barrel assembly are serialized matched sets. Do not mix these assemblies.

3. Slide the cover off the receiver and barrel assembly.

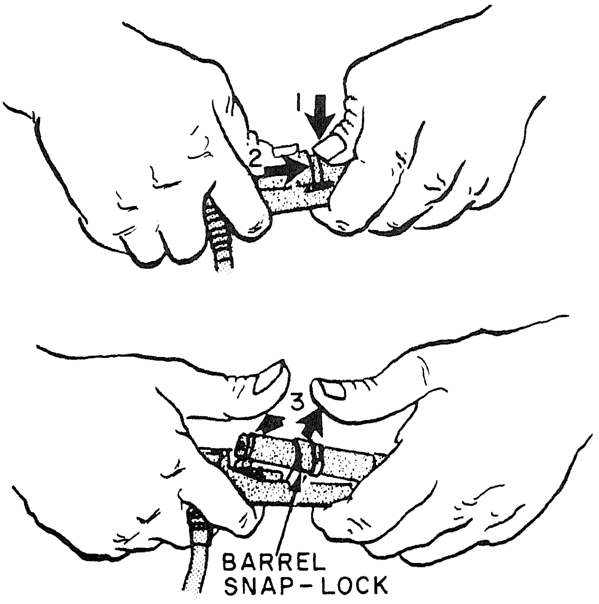

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Figure 4-2.—Disengaging barrel snap lock.

4. Disengage the barrel snap-lock. A close-up of this operation is shown in figure 4-2).

5. Remove the cartridge from the barrel assembly (figure 4-1). Do not proceed until the Collateral Duty Inspector (CDI) has verified this step.

6. Remove the actuator and the arming cable housing from the parachute container.

INSPECTION

To inspect the automatic actuator, proceed as follows:

1. Inspect the cover and power cable housing assembly for nicks, gouges, distortion, corrosion, security of power cable housing.

2. Inspect the power cable for freedom of movement and secure attachment of the swaged ball and power cable eye.

3. Inspect the receiver and barrel assembly for excessive nicks, cracks, gouges, distortion, corrosion or other damage which could cause malfunction in service.

4. Inspect the firing pin on the hammer for flattening, gouges or other damage (figure 4-3).

5. You must secure the arming pin by inserting the pin in the retainer while the barrel is unlocked. Press the pin into place firmly until it locks into the pin groove. The pin should now be held securely. Do not twist the socket as this will break the shear pin.

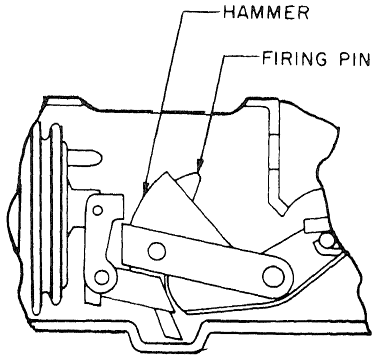

Figure 4-3.—Checking firing pin and hammer.

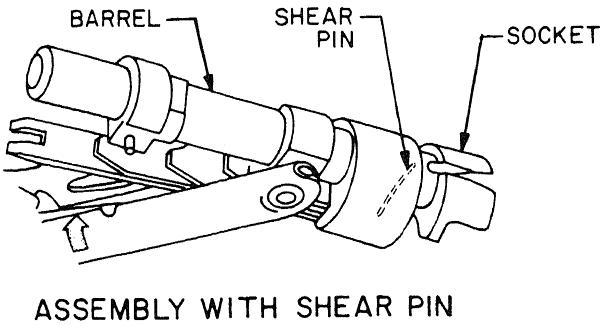

Figure 4-4.—Checking for proper retention of socket by a shear pin.

NOTE: Early Model 7000 actuators use safety wire as shown in figure 4-1. When inspecting these actuators, check for security and proper type of wire.

6. Inspect the socket for visible damage and retention of the socket and piston by a shear pin (figures 4-1 and 4-4).

7. Inspect the snap-lock pins for security and absence of damage (figures 4-1 and 4-5).

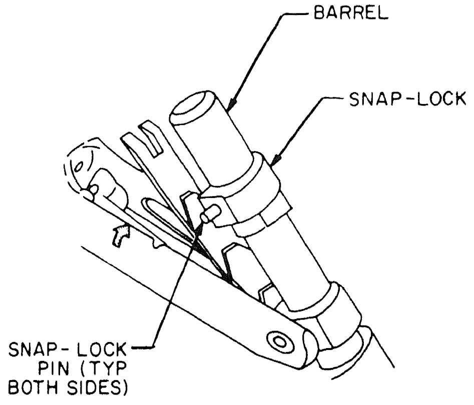

Figure 4-5.—Checking for security of snap lock.

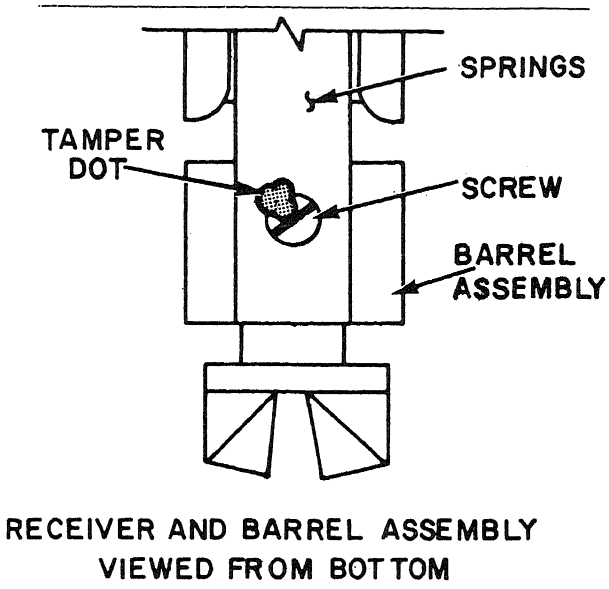

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Figure 4-6.—Checking springs and tamper dot.

NOTE: If the tamper dot is broken, you need to torque the screw to a value of 14 1/2 to 15 1/2 inch-pounds and apply a new tamper dot.

8. Inspect the leaf springs on the receiver and barrel assembly for damage. Make sure the retaining screw has not loosened (check the tamper dot on the screw and spring shown in figure 4-6).

9. Check the sealing compound on the aneroid screw shown in figure 4-7. The seal must be intact and undisturbed. Cracks due to normal aging of seal material are acceptable.

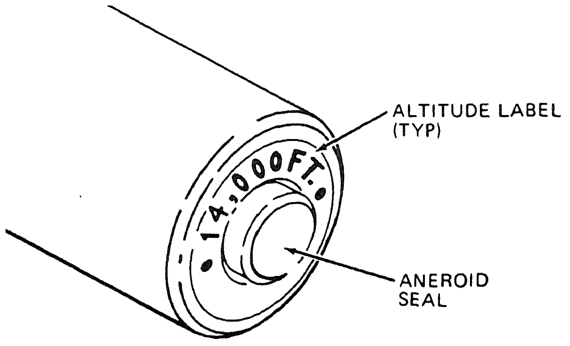

Figure 4-7.—Inspecting aneroid seal.

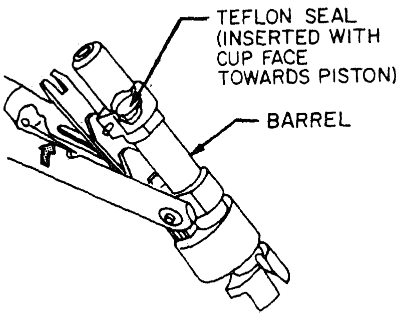

Figure 4-8.—Inspecting gasket seal.

10. Inspect the Teflon seal. Be sure that the cup side of the seal is facing the piston. (See figure 4-8).

FIRING ALTITUDE CHECK

To check for proper firing altitude of the automatic actuator, you must first be familiar with the Automatic Parachute Actuator Tester.

AUTOMATIC PARACHUTE ACTUATOR TESTER

The automatic parachute actuator tester, shown in figure 4-9, is designed to test the

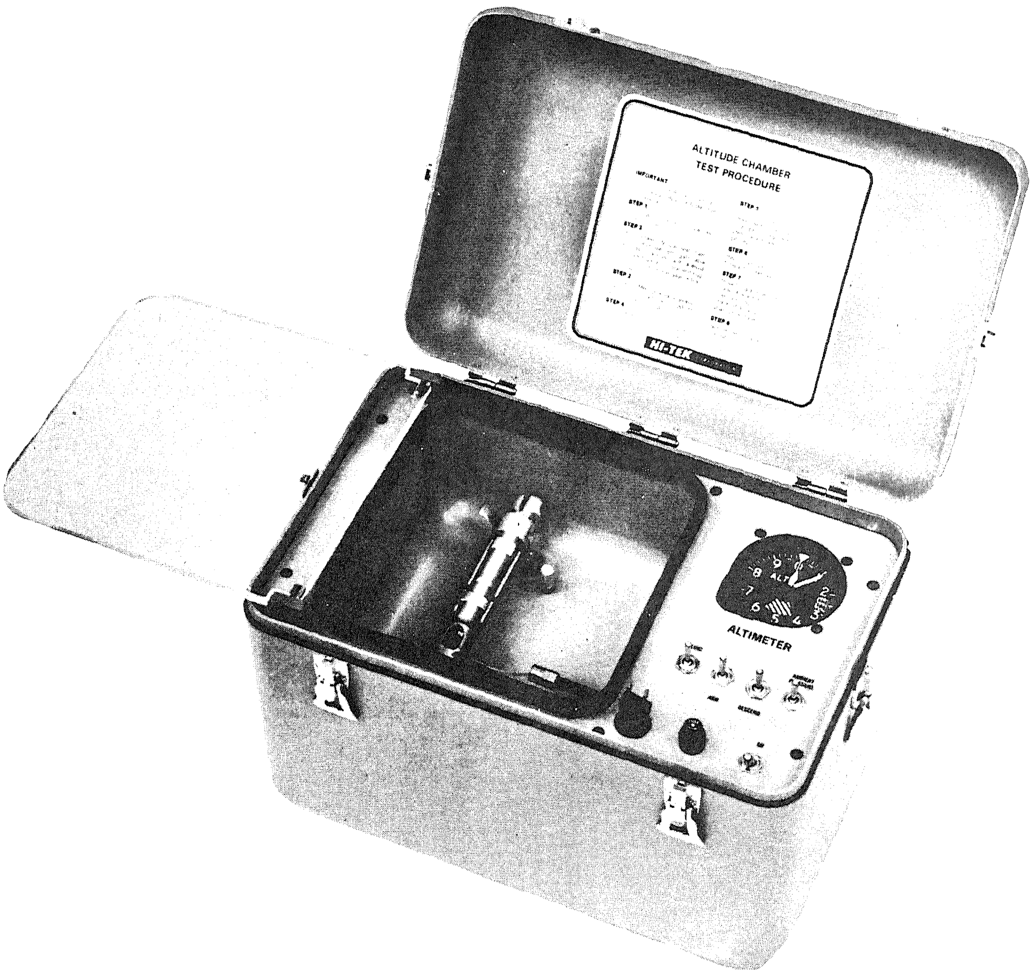

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Figure 4-9.—Automatic parachute actuator tester.

itivity of the automatic actuator to a preset sure altitude through use of an aneroid block- mechanism.

The principal action that you test is the con- ncy of the aneroid in actuating the release hanism at a predetermined altitude. To do , you first evacuate air from a test chamber mulate an increase in altitude. When you have ieved a simulated altitude above the preset ude of the actuator, you extract the arming which arms the parachute actuator firing hanism. Then you bleed outside air back at ntrolled rate into the test chamber to simulate ecific rate of descent. When the pressure hes the value for which the automatic actuator been set, the aneroid will unlock the sear if pressure sensitivity is within tolerance.

The test chamber, its evacuation system, rumentation, and controls are packaged in one tainer. The test chamber is designed to with- d a vacuum equivalent to an altitude of 30,000 . The chamber holds the entire 7000 series omatic parachute actuator and includes the essary brackets to support and position the iator within the chamber during the test e. An access door and observation window are provided.

NOTE: Before testing an automatic parachute iator, the test chamber altimeter should read 2 inches of mercury barometric pressure.

TUATOR TEST PROCEDURE

Plug the test unit's power cord into a 115-volt, Iz, a-c power source. Place the power switch he ON position, open the test chamber door, insert the arming pin cable into the side of actuator with the aneroid end toward the rator.

To test the actuator, follow these procedures:

1. Assure the test chamber has been cali- ted. Install the test chamber substitute arm- pin in the actuator. If the barometric pressure ding of the altimeter isn't 29.92 you will not a true reading of the firing altitudes. refore, you must adjust the altimeter to the per setting when required.

2. Install a dummy cartridge. CAUTION: not release the actuator firing mechanism without a dummy cartridge installed, as this could distort the firewall. This distortion could cause a later malfunction.

3. Press the barrel down into position in the receiver. As the barrel reaches the proper position, exert forward pressure on the snap-lock, causing the snap-lock pins to lock the barrel in position (see figure 4-10).

4. Install the barrel and receiver into the test chamber. Check your altimeter (shown in figure 4-9) for a setting of 29.92.

5. Evacuate the chamber to an altitude of 25,000 feet. This is done by using the climb toggle switch.

6. Decrease the altitude by using the descend toggle. The chamber simulates descent at a rate of 175 to 200 feet per second.

7. At approximately 20,000 feet actuate the arm toggle switch to withdraw the arming pin from the barrel and receiver.

8. At the firing altitude the actuator should fire. (You have a tolerance of plus or minus 1,000 feet at this time.)

9. Record the altitude at which the actuator's firing pin strikes the dummy cartridge. The firing altitude is recorded on the parachute configuration, inspection, and history record. The Collateral Duty Inspector will check this point of procedure.

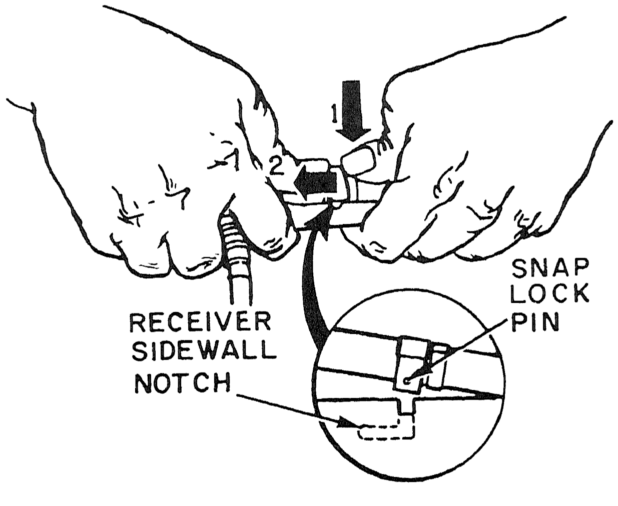

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Figure 4-10.—Locking barrel assembly.

WARNING: After test firing, you must not use a metal tool to push the hammer and lock assembly back from the firing wall. Take extreme care to avoid scratching or abrading the polished surface of the lock. The purpose of the lock assembly is to mate with the aneroid sear and initiate firing at a prescribed altitude. A rough or scratched locking assembly may cause a hangup during the unlocking function.

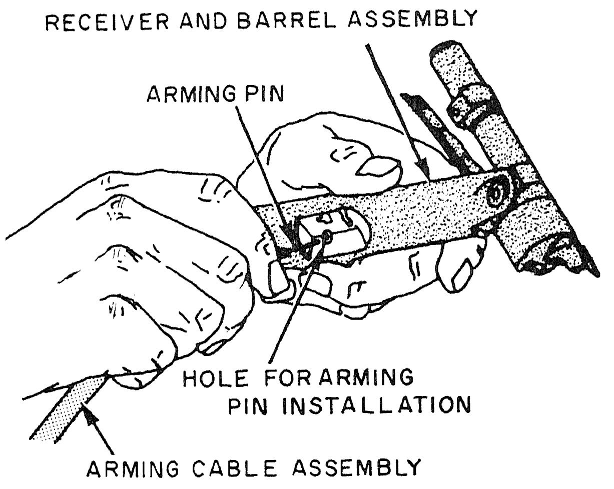
NOTE: Actuators with part numbers 711-07022-30 (10,000-foot) must fire at 10,000 feet (plus or minus 1,000 feet) pressure altitude. Actuators with part number 711-07022-34 (14,000-foot) must fire at 14,000 feet (plus or minus 1,000 feet) pressure altitude.

10. Three firing altitude checks must be made. Any actuator which does not meet test requirements on all three checks will be rejected. Adjustments are not to be made.

11. Remove the dummy cartridge and inspect it for an indentation caused by the hammer firing pin striking the cartridge. This dent must be visible to the CDI performing the inspection.

ARMING AND ASSEMBLING THE ACTUATOR

The following instructions are the same type you will follow in the shop when arming and assembling the Model 7000 Actuator. When you come to a step that is underscored, that step must be inspected by a CDI.


RECEIVER AND BARREL ASSEMBLY
ARMING PIN
HOLE FOR ARMING PIN INSTALLATION
ARMING CABLE ASSEMBLY

239.230

Figure 4-11.—Installing an arming cable.

1. To arm the actuator that is installed in a parachute, your first step is to insert the arming cable housing through the holes in the parachute container and actuator pocket.

2. Next, feed the arming cable through the arming cable housing. Depending on application, the arming cable may be inserted at either side of receiver and barrel assembly (see figure 4-11).

3. With the actuator barrel in the open position, install the arming pin into the actuator. The pin must pass through the hole in the side of the receiver, through the firing mechanism lock, and out the opposite side of the receiver.

4. Next, you connect the arming cable housing to the receiver and barrel assembly. Ensure the safety retainer secures the housing to the receiver (see figure 4-12). Be sure that you check

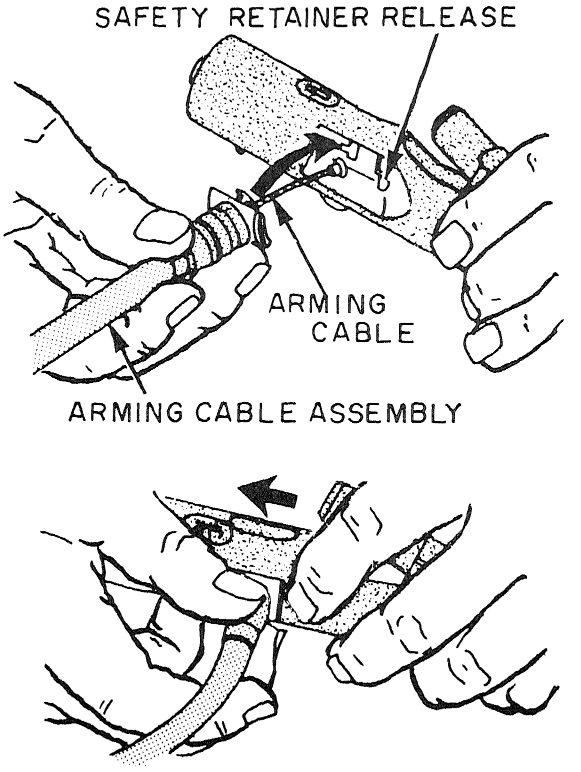


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Figure 4-12.—Installing an arming cable housing.

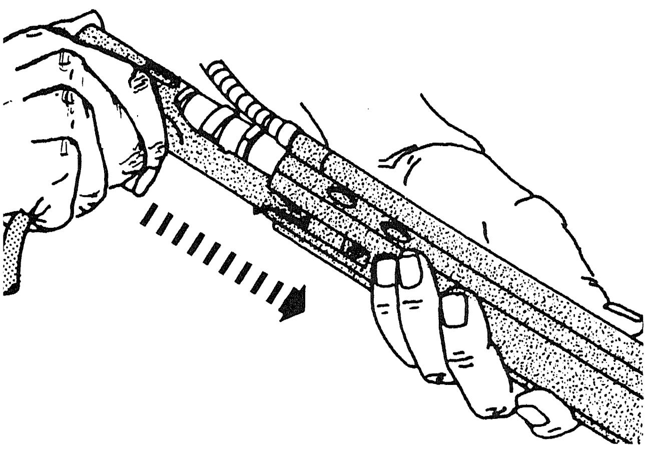

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Figure 4-13.—Sliding receiver and barrel into cover assembly.

the cartridge service life at this time. You should not install a cartridge that will expire prior to the next scheduled repack of the assembly. Refer to NAVAIR 11-100-1 for the service/total life of cartridges.

5. You should enter the cartridge time delay, part number, type, expiration date and lot number on the Parachute Configuration, Inspection, and History Record.

6. Insert a proper time delay cartridge in the barrel. Refer to the applicable parachute chapter to determine which time delay cartridge should be used. While you are pressing down on the barrel, look through the inspection hole in the receiver and ensure that the hammer assembly does not swing towards the firewall. If the hammer swings, the arming pin is improperly installed. Do not attempt to assemble the actuator any further, as this could fire the cartridge.

7. Press the barrel down into position in the receiver (see figure 4-10). As the barrel reaches proper position, exert forward pressure on the snap-lock. This causes the snap-lock pins to lock the barrel in position. Ensure that the snap-lock is aligned with the alignment arrow.

8. Hold the actuator as shown in figure 4-13 and slide the receiver and barrel assembly into the cover and power cable assembly until the holes for the screw are aligned.

9. Install the locking screw and lockwasher. Apply a tamper dot to the locking screw, using red lacquer.

CHECKOUT OF ARMED ACTUATOR

To check out an armed automatic actuator, you should proceed as follows:

1. Check the arming cable for proper installation as shown in figure 4-14. The arming pin must be visible (extending through the side of the receiver).

2. Check for correct position of the spring and centering of roll pin in hole (see figure 4-15).

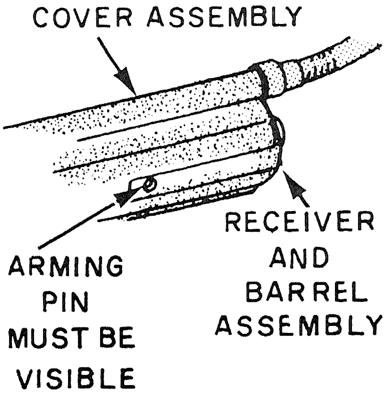

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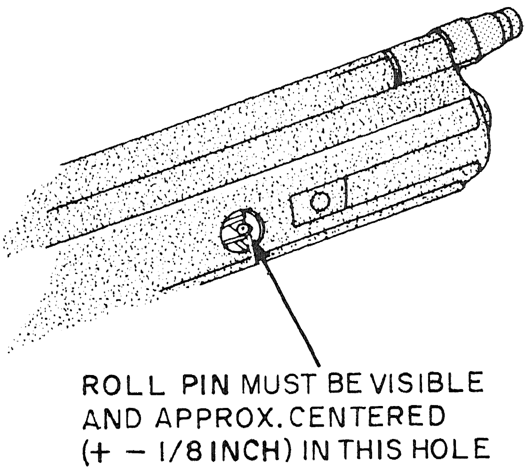
Figure 4-14.—Checking arming pin for proper installation.



ROLL PIN MUST BE VISIBLE AND APPROX. CENTERED (+ – 1/8 INCH) IN THIS HOLE

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Figure 4-15.—Checking roll pin.

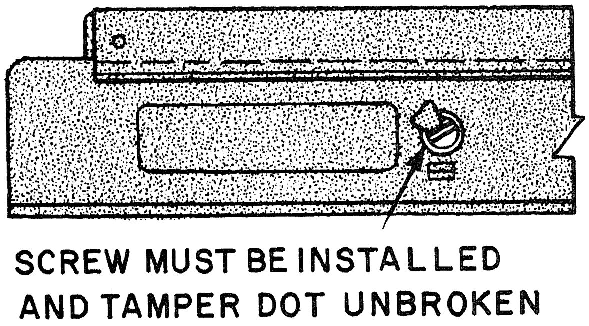

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Figure 4-16.—Checking lock screw.

3. Check that the locking screw is installed. Be sure that the tamper dot isn't broken (see figure 4-16).
4. Check for proper position of the aneroid (see figure 4-17).
5. The cartridge must be installed (see figure 4-18). Look through the port and verify that the cartridge is installed.
6. Complete the actuator installation in accordance with an applicable parachute chapter in NAVAIR 13-1-6.2.

To install an automatic parachute actuator, you must refer to the *Aircrew Systems Manual for Personnel Parachutes*, NAVAIR 13-1-6.2. Repacking a parachute with an actuator is covered later in this text.

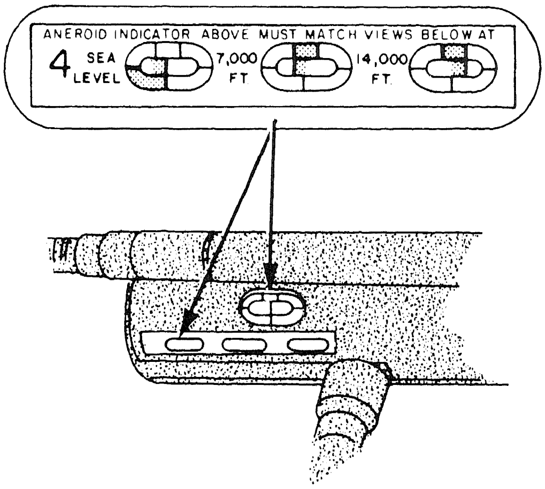

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Figure 4-17.—Checking for proper position of aneroid.

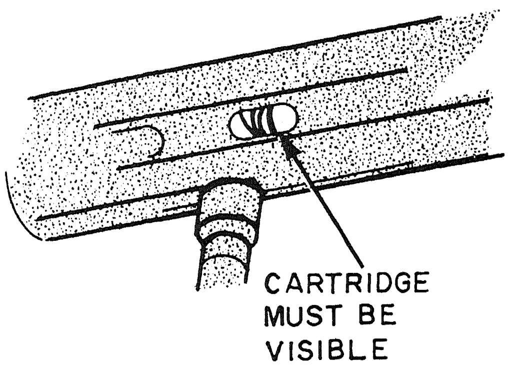

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Figure 4-18.—Checking for cartridge.

GUN ASSEMBLY, BALLISTIC SPREADING

The ballistic spreading gun is a mechanically actuated device that ensures rapid inflation of the main parachute canopy, and reduces random inflation time of the canopy during high-speed ejections (figures 4-19 and 4-20).

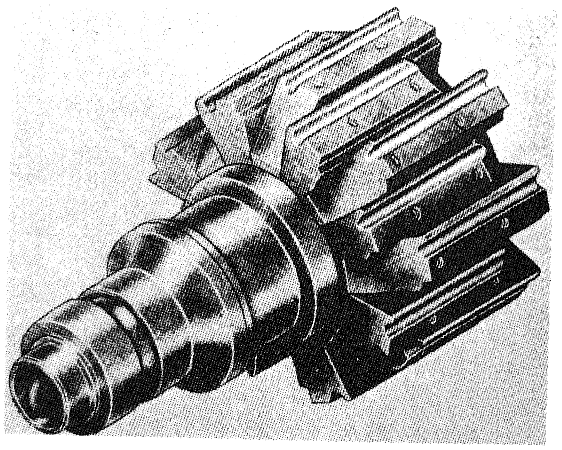

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Figure 4-19.—Spreading gun assembly.

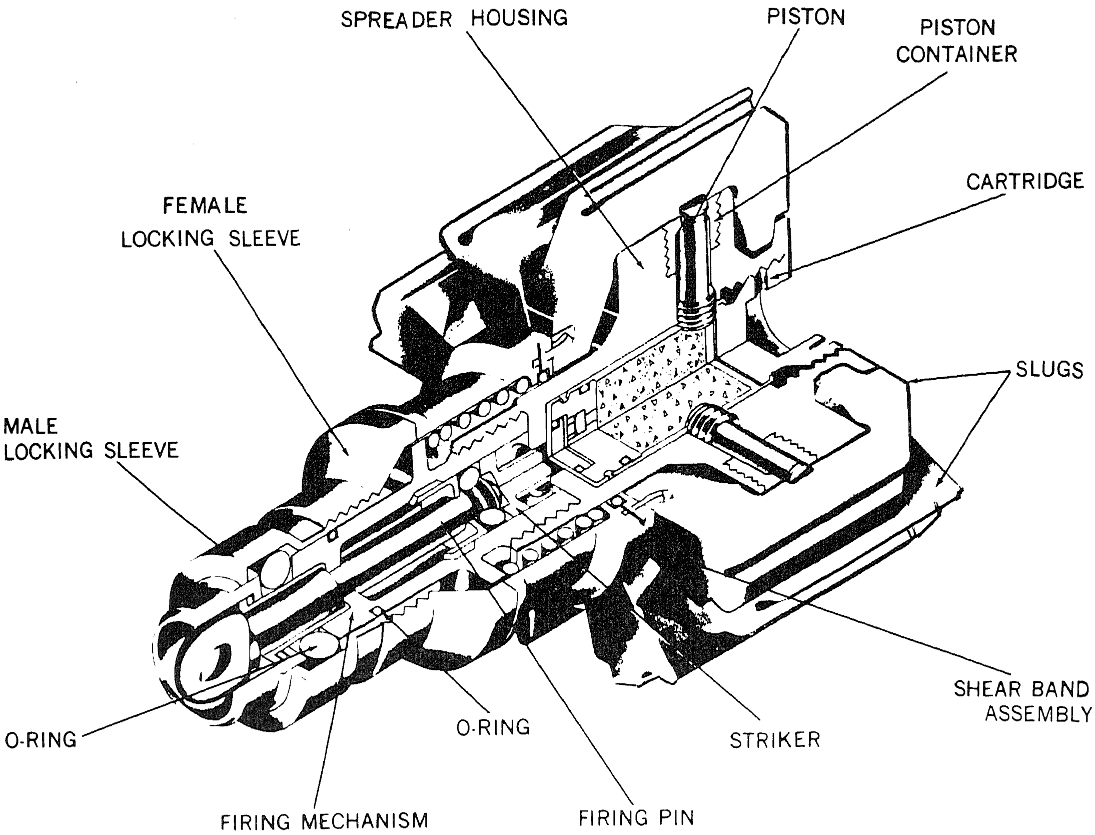


Figure 4-20.—Spreading gun assembly parts breakdown.

DESCRIPTION

The spreader gun assembly consists of a spreader housing, 14 pistons, slugs, and retainers, an impulse cartridge, a fail-safe mechanism, and a hardware retention lanyard.

The spreader gun is provided with a fail-safe assembly in the event of a cartridge malfunction. The fail-safe assembly consists of a nylon sleeve clipped to the sheer band assembly.

A safety pin is inserted in the firing mechanism during handling to prevent accidental firing.

The cartridge for the spreader gun is threaded into the breech of the housing and has a retention cord attached.

The spreader gun is positioned at the hem of the main parachute between the retaining cord and lower firing lanyards. The retaining cord is looped around the vent lines and the pilot parachute connector cord. The lower firing lanyard is attached to the connector link next to the suspension lines. Two suspension lines and a loop from the parachute hem are attached to each slug. A cover plate holds the two lines and loop in the channels of each slug.

OPERATION

When actuated, the parachute canopy deploys by either an internal pilot chute or by the external pilot chute. Just prior to full canopy and suspension line deployment, the firing lanyard pulls the firing pin from the firing mechanism. This releases the striker which strikes the cartridge primer. As the cartridge fires, the 14 slugs are propelled outward. They simultaneously drag the attached suspension lines outward in a 360°

spread. This firing sequence occurs prior to any tension being placed on the suspension lines. Spreading is stopped when tension starts to build up in the suspension lines; so, at high speed it produces a 4-foot diameter mouth and at low speed an 8-foot diameter mouth.

In the event of a cartridge malfunction a ''failsafe'' backup subsystem operates. After the firing pin is withdrawn, the firing lanyard exerts 24 to 35 pounds of tension on the failsafe asssembly sleeve which retracts the shear band assembly. This releases the slugs and allows the canopy to inflate aerodynamically.

IDENTIFICATION AND HANDLING

An identification tag is attached to the spreader gun and contains the following data: nomenclature, manufacturer's part number, revision status, serial number, date of manufacture, and name and address of the manufacturer.

A warning label is sewn on each side of the sleeve protecting the firing lanyard and to the outer pack assembly. This reads:

WARNING

THIS PARACHUTE CONTAINS A CARTRIDGE ACTUATED DEVICE. FOR HANDLING INSTRUCTIONS SEE PARACHUTE PACKING MANUAL.

There is a tag attached to the safety pin that reads: REMOVE PIN BEFORE PACKING. Assemblies shipped without a cartridge must have a shipping plug installed.

Service Life

Service life for the cartridge is five years, beginning from the date of manufacture stamped on the cartridge and on the hermetically sealed container. When the hermetically sealed metal container is opened, the service life expiration date (month and year) shall be marked with indelible ink on the side of each cartridge. Service life is now 30 months from this date but not to exceed the five years from the date of manufacture.

NOTE: If packaged in other than a hermetically sealed metal container, the service life shall be 36 months from date of manufacture regardless of when it is installed.

Log Entries

You should enter in the Parachute History and Record Card the date of primary installation of the spreader gun to the parachute canopy, and the lot number and expiration date of the cartridge.

Safety Precautions

Treat the spreader gun as a delicate instrument. The spreader gun cartridge is treated as Class C ammunition in accordance with the general safety precautions given in the cartridge manual (NAVAIR 11-100-1.1).

YOU MUST ALWAYS REMEMBER THAT THE BALLISTIC SPREADING GUN IS LETHAL WHEN ACTIVATED WITHOUT A CANOPY ATTACHED. DO NOT REMOVE THE SAFETY PIN UNTIL THE PROPER TIME AS PRESCRIBED IN THE PACKING MANUAL.

DO NOT REMOVE LANYARD RETAINING PIN WHEN REPLACING UPPER RETAINING CORD.

NOTE: Be sure that the cartridge service life will not expire prior to the next service check. Be sure the cartridge expiration date is entered in the Parachute History and Record Card.

REMOVAL OF BALLISTIC SPREADING GUN

Before you work on a spreader gun, always ensure that a safety pin is installed. If you have to remove a damaged or defective spreading gun, proceed as follows:

1. Loosen the screws holding the plates to the spreading gun slugs to allow suspension lines to be removed.

2. Slip all the suspension lines and attached loops from under the plates.

3. Disconnect the retaining cord from the vent lines.

4. Tie one end of a temporary 20-foot line to the vent lines, and tie its other end to the free end of the retaining cord.

5. Pull the retaining cord out of the canopy from the skirt end.

6. Untie the temporary 20-foot line from the retaining cord and remove the damaged or defective gun from the table.

7. To install a new or repaired spreading gun, follow the procedures outlined in the applicable parachute assembly chapter.

REPAIR OF EXCESSIVE GAPS BETWEEN ADJACENT CANOPY SLUG PLATES

During the inspection of a ballistic spreading gun you are required to check for excessive gaps between adjacent canopy slug plates. To do this use a 0.050 inch feeler gauge (minimum length 2 1/2″) to check the gap between adjacent (canopy slug) plates. Press the long dimension of the gauge firmly against the gap along the entire length of each canopy slug plate. If the feeler gauge can be passed between adjacent slug plates, the gun must be repaired or replaced. To repair excessive gaps between adjacent canopy slug plates, proceed as follows:

1. Remove the plate(s) where the gun failed to pass inspection.

2. Cut a 1 × 1 1/2-inch strip of ordnance tape for each defective slug plate.

CAUTION: Do not tape over the screw holes on the back surface of the plate.

NOTE: When you wrap the tape around the plate width, the tape ends should line up with the outer diameter of the screw holes on the back of the plate where the plate contacts the slug.

3. Apply the tape starting on the back of the plate adjacent to the screw holes. Continue around to the front of the plate covering both screw holes, and around to the back ending at the edge of the screw holes.

4. Use a screw to puncture the covered screw holes (from front to back of plate).

5. Reinstall the slug plate and check the gap tolerance (less than 0.050 inch). If the gun passes the inspection, return the gun to service.

CAUTION: Do not apply more than one layer of tape to individual plates.

6. If the gaps between the slug plates are more than 0.050 inch, repeat the above procedures on adjacent plates in the affected area. Check gap after each application of tape; tape as many plates as necessary to pass the inspection.

7. If any slugs are excessively loose and cannot be repaired, return the gun to Supply as NON-RFI.

8. You need to record accomplishment of repairs on the Parachute Configuration, Inspection and History Record.

BALLISTIC SPREADING GUN CARTRIDGE REPLACEMENT AND PULL-FORCE CHECK

Before you attempt to replace a cartridge, you must remember this WARNING:

The spreading gun employs an explosive cartridge. Failure to observe procedures in this paragraph could result in your death or serious injury.

NOTE: You must use only the special tools furnished for cartridge removal or replacement. It is recommended that a helper assist the person performing the cartridge replacement by verifying procedures as each step is accomplished. You must perform a firing pin pull-force check each time you replace a cartridge.

By following the steps outlined below you can replace the cartridge and perform the firing pin pull-force test in a safe manner.

1. Clamp the spreading gun test fixture to the packing table. Use one C-clamp positioned as

close as possible to the clamp assembly. See figure 4-21 for the test fixture parts identification.

2. You must remove the cartridge extractor wrench from the swivel bolt attached to the spreading gun clamp assembly.

3. Then place the cartridge end of the spreading gun into a spreading gun clamp assembly (see figure 4-22). Ensure that the lip on the clamp assembly circles the spreading gun housing. Route the retaining cord through the vertical slot in the center of the clamp and spread suspension lines to prevent entrapment between gun and clamp. Position the swivel bolt in the horizontal slot in the clamp and torque the swivel bolt nut to 7 ± 1/2 foot-pounds.

4. Place the pins of the cartridge extractor wrench into holes in the cartridge. Loosen the cartridge using pressure against a 3/4-inch socket as shown in figure 4-23.

NOTE: If you have difficulty in removing the cartridge by using the extractor wrench furnished with the test fixture, use a special cartridge extractor tool. Cut and remove the retaining cord at the base of the cartridge. Place the slot of the special tool over the retaining cord pin and loosen the cartridge by using a 1/2-inch socket.

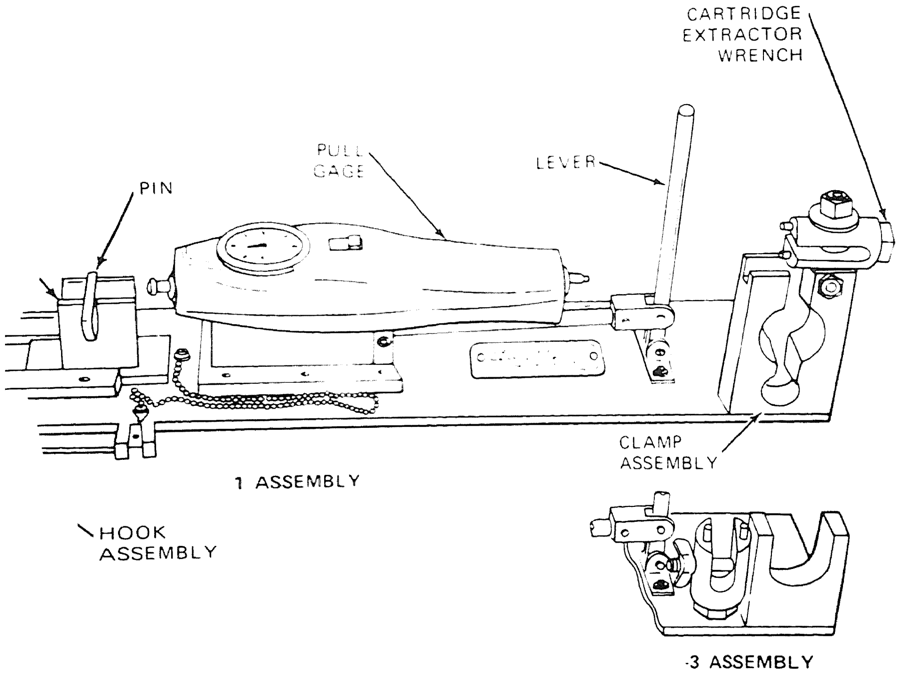
5. Remove the spreading gun from the clamp/V block assembly. Manually unscrew and remove the cartridge from the chamber.

6. Remove the cartridge from the retaining cord by removing the pin. Retain the pin for reinstallation if required. The old cartridge must be disposed of in accordance with current directives.

7. Remove the safety pin from the spreading gun.

8. Spread the canopy skirt hem and suspension lines to expose the cartridge chamber. Slide the spreading gun onto the test fixture shaft so that the shaft butts against the bottom of the cartridge chamber. (See figure 4-24.)

9. Open the four snap fasteners on the spreading gun extractor sleeve to expose the firing pin housing. Slide the block assembly at the center of the test fixture under the firing pin housing until the block assembly pin slides into



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ire 4-21.—Spreading gun test fixture.

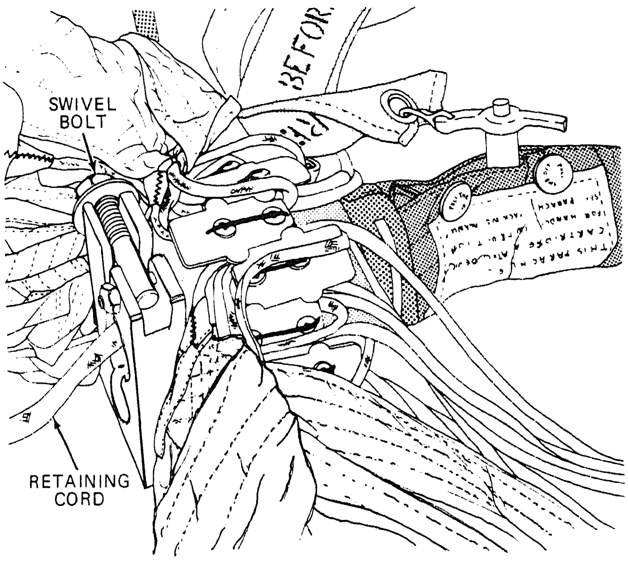

Figure 4-22.—Placing spreader gun in gun clamp.

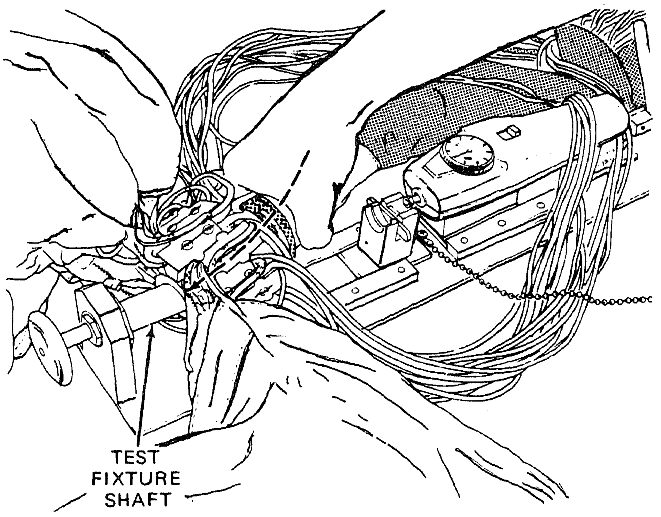

Figure 4-24.—Sliding on to test fixture.

the base plate hole. Align the firing pin so that the hole in the firing pin is horizontal and the firing lanyard is located at the top. (See figure 4-25.)

10. Attach the hook assembly to the firing pin hole and slide the hook assembly block over the nut that is attached to the pull gage. (See figure 4-21.)

11. Move the switch on the pull gage to the center position. You must zero your meter needle by rotating the bezel on the dial. Move the

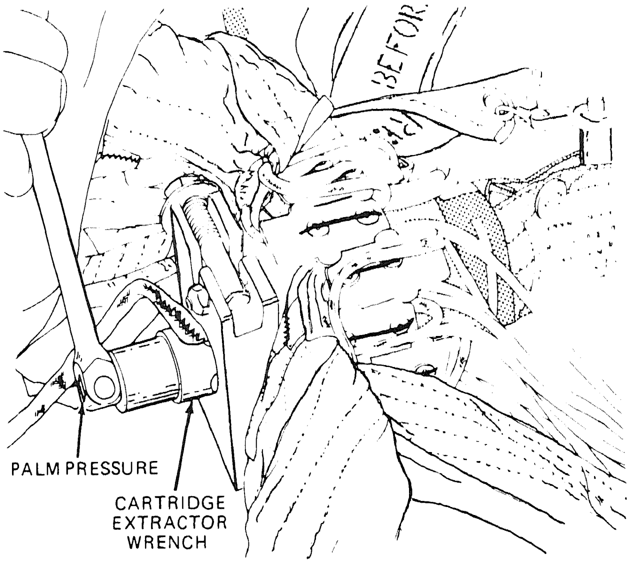

Figure 4-23.—Loosening cartridge.

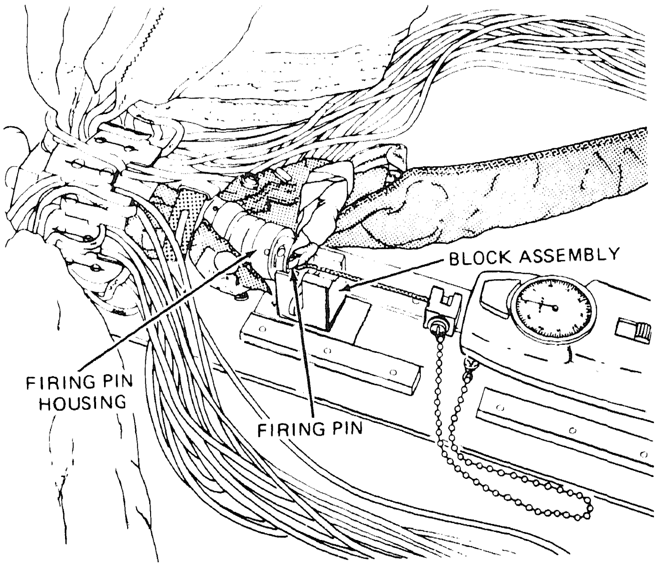

Figure 4-25.—Spreading gun installation.

close as possible to the clamp assembly. See figure 4-21 for the test fixture parts identification.

2. You must remove the cartridge extractor wrench from the swivel bolt attached to the spreading gun clamp assembly.

3. Then place the cartridge end of the spreading gun into a spreading gun clamp assembly (see figure 4-22). Ensure that the lip on the clamp assembly circles the spreading gun housing. Route the retaining cord through the vertical slot in the center of the clamp and spread suspension lines to prevent entrapment between gun and clamp. Position the swivel bolt in the horizontal slot in the clamp and torque the swivel bolt nut to 7 ± 1/2 foot-pounds.

4. Place the pins of the cartridge extractor wrench into holes in the cartridge. Loosen the cartridge using pressure against a 3/4-inch socket as shown in figure 4-23.

NOTE: If you have difficulty in removing the cartridge by using the extractor wrench furnished with the test fixture, use a special cartridge extractor tool. Cut and remove the retaining cord at the base of the cartridge. Place the slot of the special tool over the retaining cord pin and loosen the cartridge by using a 1/2-inch socket.

5. Remove the spreading gun from the clamp/V block assembly. Manually unscrew and remove the cartridge from the chamber.

6. Remove the cartridge from the retaining cord by removing the pin. Retain the pin for reinstallation if required. The old cartridge must be disposed of in accordance with current directives.

7. Remove the safety pin from the spreading gun.

8. Spread the canopy skirt hem and suspension lines to expose the cartridge chamber. Slide the spreading gun onto the test fixture shaft so that the shaft butts against the bottom of the cartridge chamber. (See figure 4-24.)

9. Open the four snap fasteners on the spreading gun extractor sleeve to expose the firing pin housing. Slide the block assembly at the center of the test fixture under the firing pin housing until the block assembly pin slides into

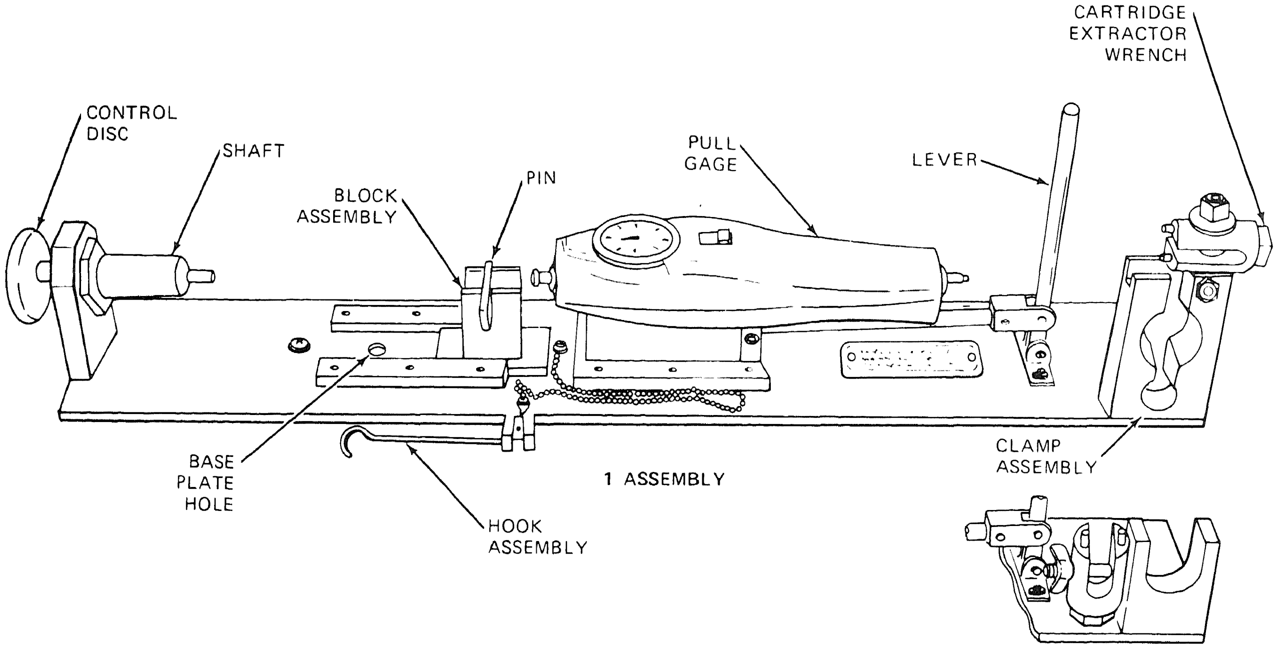

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Figure 4-21.—Spreading gun test fixture.

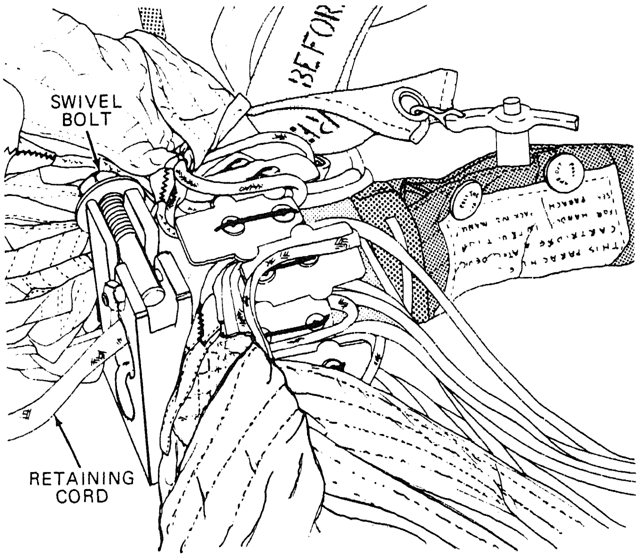


Figure 4-22.—Placing spreader gun in gun clamp.

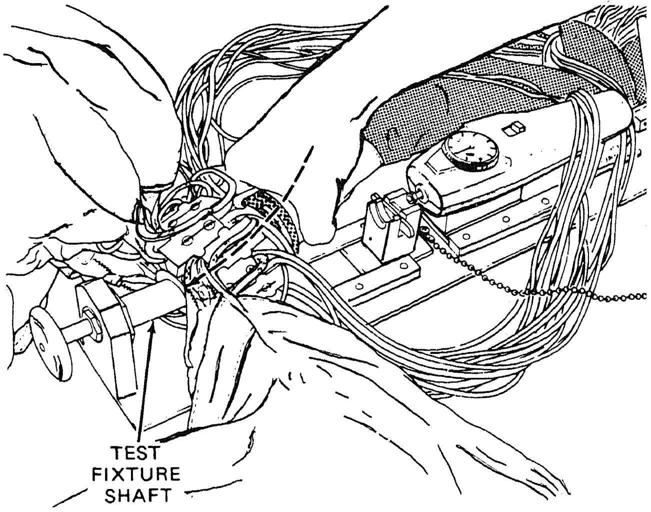


Figure 4-24.—Sliding on to test fixture.

the base plate hole. Align the firing pin so that the hole in the firing pin is horizontal and the firing lanyard is located at the top. (See figure 4-25.)

10. Attach the hook assembly to the firing pin hole and slide the hook assembly block over the nut that is attached to the pull gage. (See figure 4-21.)

11. Move the switch on the pull gage to the center position. You must zero your meter needle by rotating the bezel on the dial. Move the

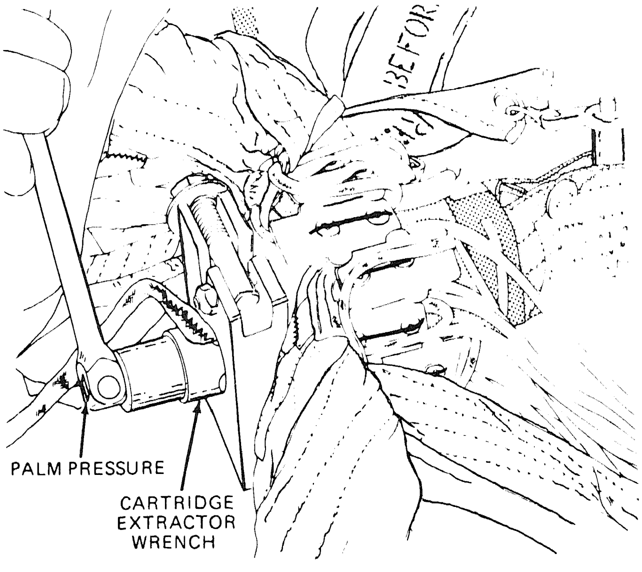


Figure 4-23.—Loosening cartridge.

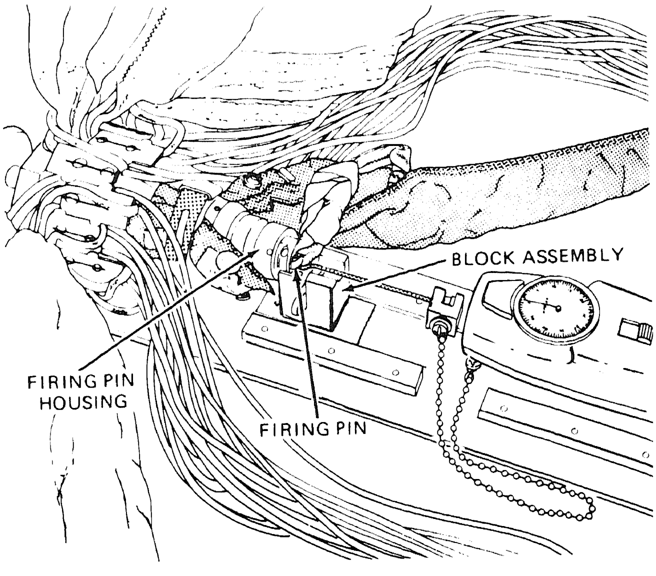


Figure 4-25.—Spreading gun installation.

switch to the full down position, away from the meter, for recording the pull force.

12. The CDI pulls the test fixture lever until the firing pin releases. The pull force must go between 25 and 38 pounds. If a gun has failed the first test, it must be retested two more times. The gun must pass both retests. Record the force required to release the firing pin on the Parachute Configuration, Inspection, and History Record. When a gun fails, it is removed and returned to Supply as a defective item.

13. After the pull-force measurement has been obtained, remove the hook assembly from the firing gun.

14. Push the firing pin back into the housing. Push the control disc firmly inward, forcing the firing pin out of the housing. Apply inward hand pressure to the firing pin as it moves out. Continue to move the control disc inward, applying hand pressure to the firing pin until the firing pin clicks into place. When a click is heard, the gun is cocked. Gently release the control disc while still exerting pressure on the pin.

15. The CDI must tug gently on the firing pin until the effect of spring loading is felt. If the pin moves without spring tension, the gun is not cocked, and step 14 must be repeated.

16. Release the block assembly by pulling the pin out of the hole in the base plate and sliding the block away from the spreading gun. Remove the gun from the shaft. Do not remove the gun by pulling on the firing lanyard.

17. At this time, install the safety pin.

CAUTION: When you are using alcohol to clean the cartridge chamber do not allow alcohol to flow inside the gun as this could damage the O-rings and lubrication.

18. Clean the cartridge chamber and threads with a small amount of denatured alcohol. Ensure that the old sealing compound and all foreign matter is removed. Tilt the gun to allow the alcohol to run out of the gun.

19. Feel the inside of the cartridge chamber to ensure that the slug pistons do not stick out inside the chamber. If the pistons do protrude, push them back as necessary. Feel the bottom of the chamber to ensure there is no foreign object in the chamber. The bottom should be smooth metal.

20. Prior to the cartridge installation, stamp on the cartridge in the approximate position shown in figure 4-26, the following information: lot number, manufacturer's symbol, month and year of loading. Use black marking ink and make the characters as large as practicable for the available space. The same markings, plus expiration date, must also be stamped on the cartridge head using characters no smaller than 1/16 inch high.

21. Record the type of cartridge, part number, delay time, lot number, and service life expiration date on the Parachute Configuration, Inspection, and History Record.

22. Apply sealing compound to the first two threads of the cartridge. (See figure 4-26.)

23. Attach the new cartridge to the retaining cord by passing the pin through the screw base of the cartridge and the loop that is located at the end of the retaining cord.

NOTE: Never force the cartridge into the chamber. This could damage the gun. When a cartridge is properly installed, the base should be approximately even with the top edge of the chamber. If the cartridge base is more than one thread above the edge, remove the cartridge and check the bottom of the chamber for any obstruction such as protruding slug pistons.

24. Having inserted the cartridge into the chamber, you tighten it manually. If the cartridge stops before the threads are engaged, remove the cartridge and again check for protruding slug pistons. Push them back if necessary.

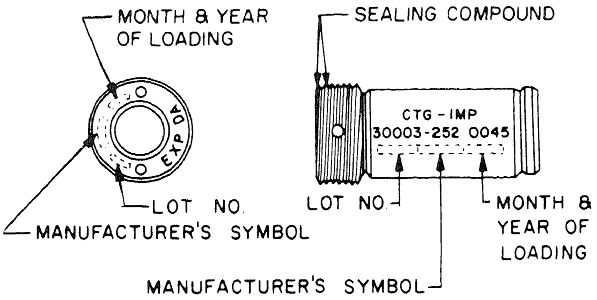


Figure 4-26.—Cartridge marking—head and side.

25. Replace the gun in the clamp/V block assembly in accordance with steps 3 and 4. Using a cartridge extractor wrench and torque wrench with a 3/4-inch socket, you must torque the cartridge to 84 inch-pounds (plus or minus 12).

26. Remove the spreading gun from the clamp/V block assembly. Do not remove the safety pin. Put the cartridge extractor wrench back on the swivel/stanchion bolt.

27. Check stowage of the firing lanyard. Restow it if necessary.

28. Close the extractor sleeve and now your job has been completed.

To install a Ballistic Spreader Gun onto a parachute, you must refer to the *Aircrew Systems Manual for Personnel Parachutes*, NAVAIR 13-1-6.2. Repacking a parachute with a ballistic spreader gun is discussed in Volume II of this text.

CHAPTER 5

CONVENTIONAL BACK PERSONNEL PARACHUTE (NB-8)

CONFIGURATION

The NB-8 personnel parachute assembly shown in figure 5-1 is a back-type parachute. The assembly includes a 28-foot diameter, flat, nylon canopy with 28 gores (figure 5-2), a container assembly (figures 5-3 and 5-4), a vane-type pilot chute (figure 5-5), a harness assembly (figure 5-6), back pad (figure 5-7), and a ripcord assembly (figure 5-8).

By describing the procedures you use to do the job, this chapter will give you the basic idea of how a back-type parachute is assembled when it is being put into service. Although there are many different types of parachutes, the basic theory of placing a large canopy, suspension lines, and pilot chute into a small container is the same.

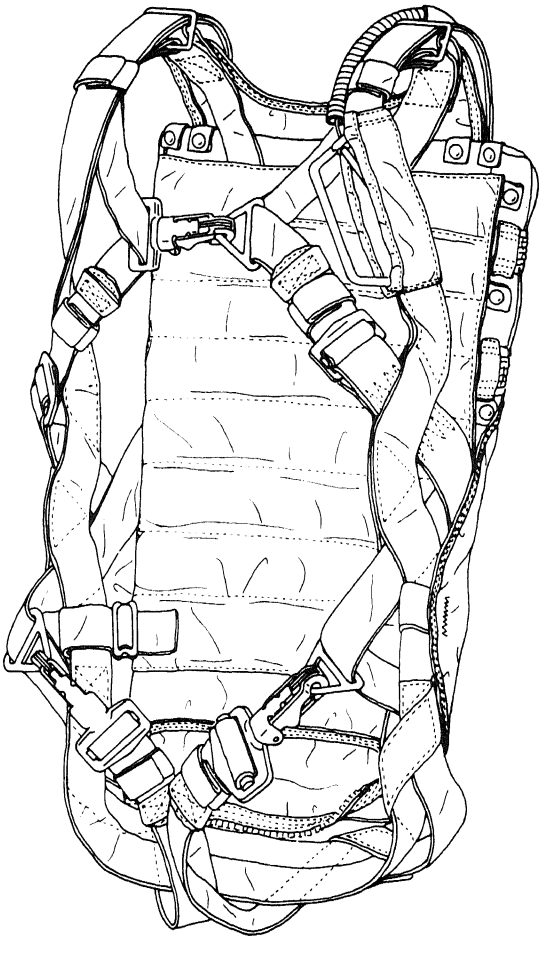


Figure 5-1.—Basic NB-8 personnel parachute assembly.

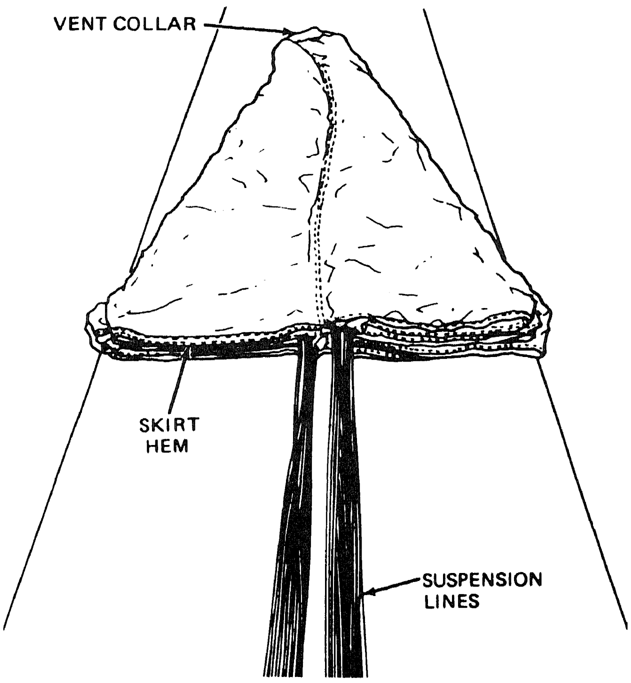


Figure 5-2.—Canopy assembly.

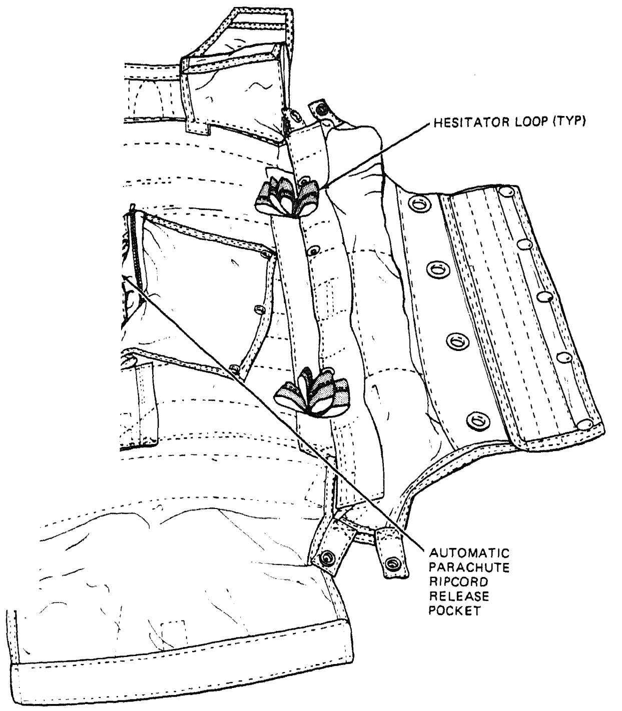


Figure 5-3.—Container assembly (inside).

NOTE: The Rate Training Manual is not to be used as a substitute for the NAVAIR 13-1-6.2 manual.

Placing a parachute into service is a lot different than repacking a parachute that is due for a normal inspection and repack. When placing a parachute into service, you look for manufacturer defects, modifications that need to be incorporated, and you make up the new Parachute History Card. Some of these procedures have been described in Chapter 3.

You will find three configurations of the NB-8 parachute in service: (1) the basic NB-8; (2) the NB-8 with a seat cushion and standard soft pack; and (3) the NB-8 with a seat pan and standard soft pack. For simplicity, we discuss only the basic NB-8 parachute here.

As with all Navy personnel parachutes, the NB-8 must be placed into service under ideal working conditions.

As you come to a C.D.I. step, (all C.D.I. steps are underlined in your shop process deck and the NAVAIR 13-1-6.2), you must remember that you cannot proceed until after the step has been inspected. Once the packing of the parachute has been started you cannot leave the job until it has been completed and inspected. If, for some reason, you cannot complete the repacking, you must remove the parachute from the packing table and resume the repacking (starting from the beginning) at a later date.

PRELIMINARY PROCEDURES FOR RIGGING NB-8 PARACHUTE

1. Lay out your packing tools on the packing table and inspect them for nicks, burrs or sharp edges which may damage the parachute assembly. Count and record the number of packing tools. Counting your tools before you start any job prevents a lot of lost time later if you are missing a tool and think you may have packed it into the parachute container.

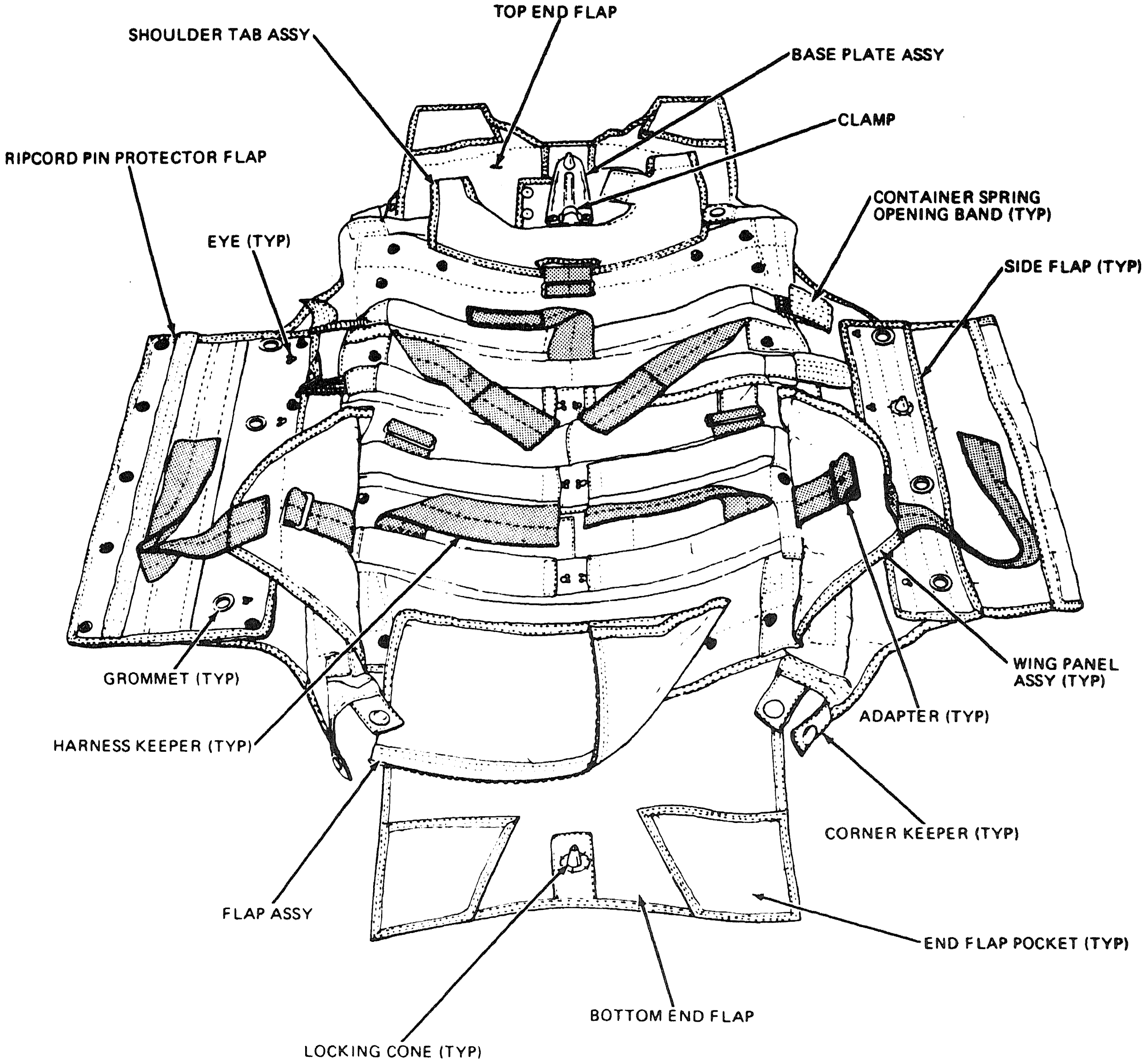


Figure 5-4.—Container assembly (outside).

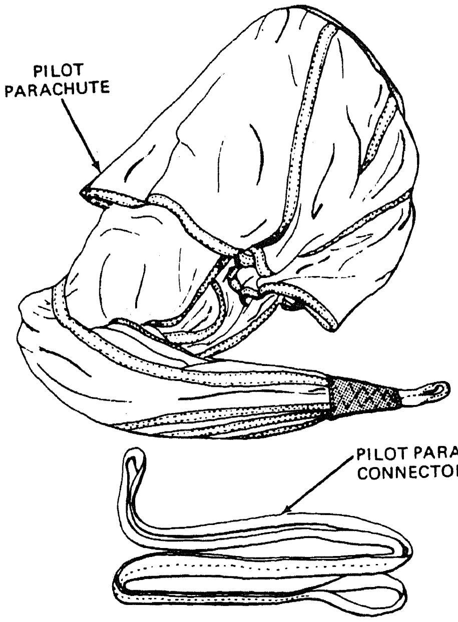


Figure 5-5.—Pilot parachute assembly.

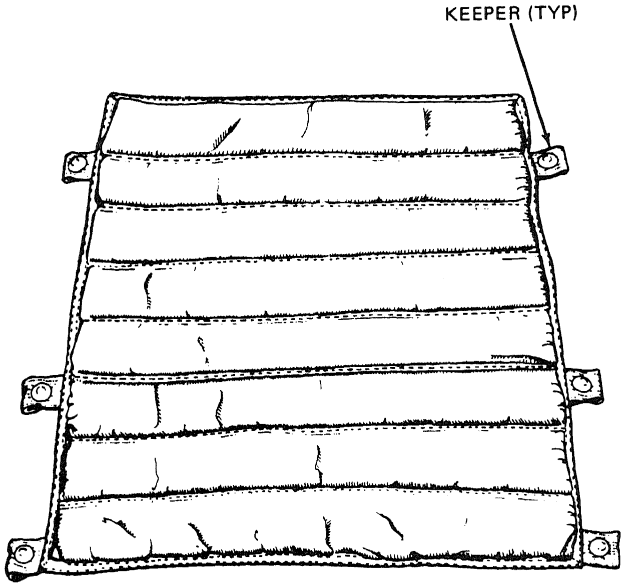


Figure 5-7.—Back pad.

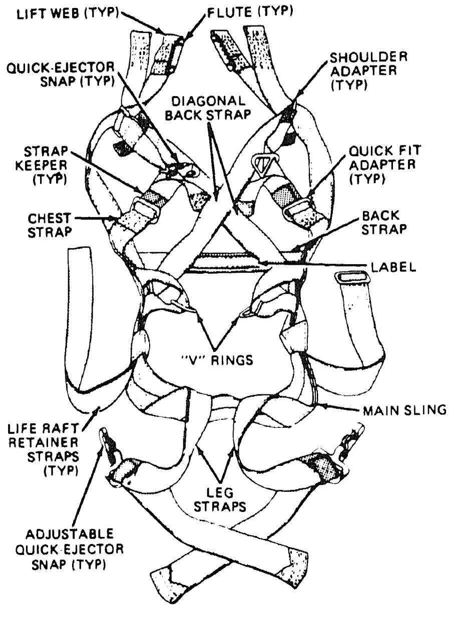


Figure 5-6.—Harness assembly.

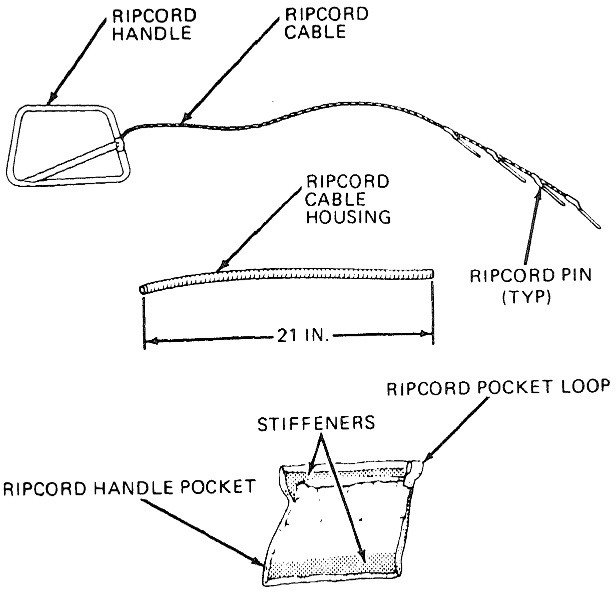


Figure 5-8.—Ripcord assembly.

2. Be sure the packing table is clean, then lay the canopy full length on it (figure 5-9). Locate canopy gore 28 (the one with the nameplate), and place it uppermost in the center of the table. Separate suspension lines into two equal groups, counting 14 lines on each side of nameplate gore. If necessary, attach a pilot parachute to the top of the canopy.

3. Arrange the two groups of 14 suspension lines on each side of the nameplate gore as viewed from connector links in accordance with figure 5-10. Numbers in figure 5-10 illustrate location and orientation of suspension lines on connector links.

4. Place the connector link which holds suspension lines 1 through 7 on top of the connector link holding suspension lines 8 through 14. Place the connector link for suspension lines 22 through 28 on top of the connector link for lines 15 through 21. Connect these two groups of connector links to their respective tension hooks on the packing table.

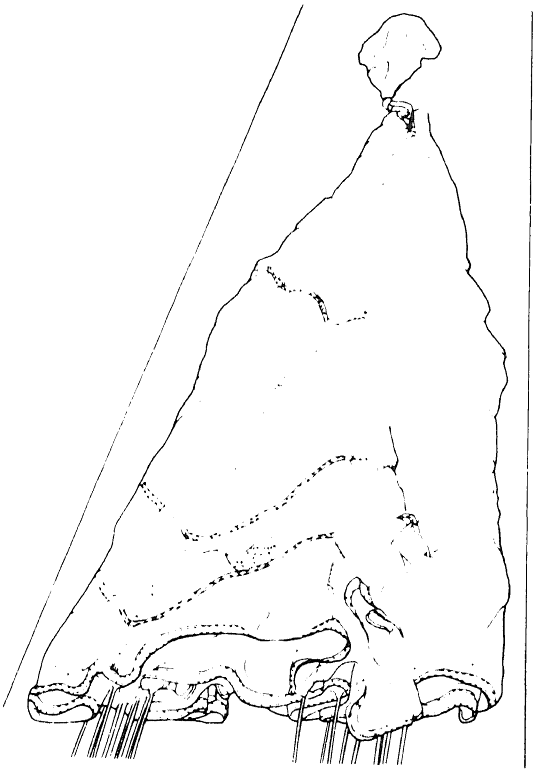


Figure 5-9.—Layout of the canopy.

⑦⑥⑤④③②①   ㉘㉗㉖㉕㉔㉓㉒

⑧⑨⑩⑪⑫⑬⑭   ⑮⑯⑰⑱⑲⑳㉑

Figure 5-10.—Arrangement of suspension lines on connector links.

NOTE: Ensure that the knurled portions of the connector link yoke and plate assemblies face up and the screwheads face outboard.

5. Your parachute is now layed out and ready to be inspected. The guidelines for the type of inspection you are making are found in NAVAIR 13-1-6.2, *Aviation Crew System Manual Personnel Parachutes*, and on the appropriate shop process cards.

After you have given the parachute a complete inspection for any manufacturer defects and modifications that need to be incorporated, you are ready to rig the parachute.

RIGGING PROCEDURES

As you prepare to rig the NB-8 or any other parachute, you must have the proper tools, a copy of the Shop Process Cards that pertain to the equipment being rigged and a up-to-date copy of the NAVAIR 13-1-6.2.

Attachment of Container to Harness Assembly

The NB-8 personnel parachute, when properly assembled, has a harness attached to the container. To attach the harness to the container assembly:

1. Place the parachute container on top of the harness assembly. Position the shoulder adapter

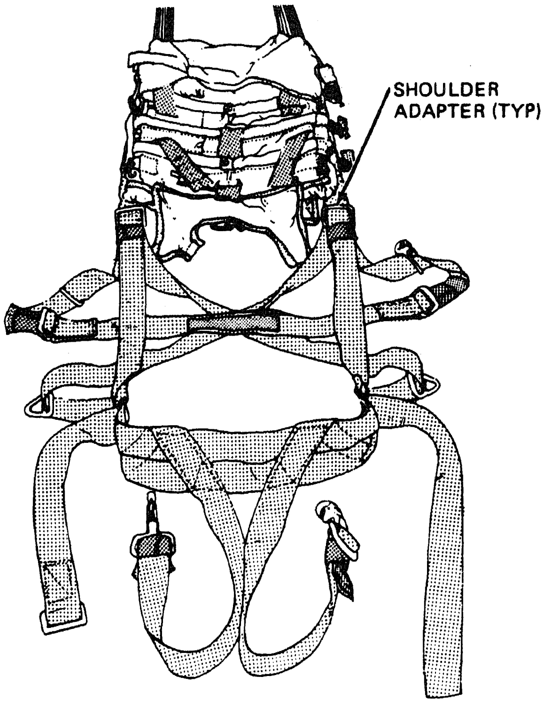


Figure 5-11.—Laying out harness (step 1).

on the harness to the top edge of the container shown in figure 5-11. At this time, you ensure that the container has eight spring opening bands. One end should be crimped to the container to prevent loss and the hook at the other end should be facing down.

2. Now rotate the harness assembly at the shoulder adapters and place them on top of the container. Ensure that the elastic strap keepers are installed (figure 5-12).

3. Position the diagonal back straps under the upper center harness keeper strap on the container and reeve the end of the keeper strap back through the adapter fitting. Position both diagonal back straps and horizontal back strap under the two keeper straps located on each side of the container and reeve the keeper straps' ends through their fittings. The keeper strap located on each wing panel is passed through the opening formed by each upper leg strap extension and around the harness webbing. Secure these keeper straps (figure 5-13).

4. Tack each keeper strap by passing one turn of waxed nylon 6-cord, single, through the straps

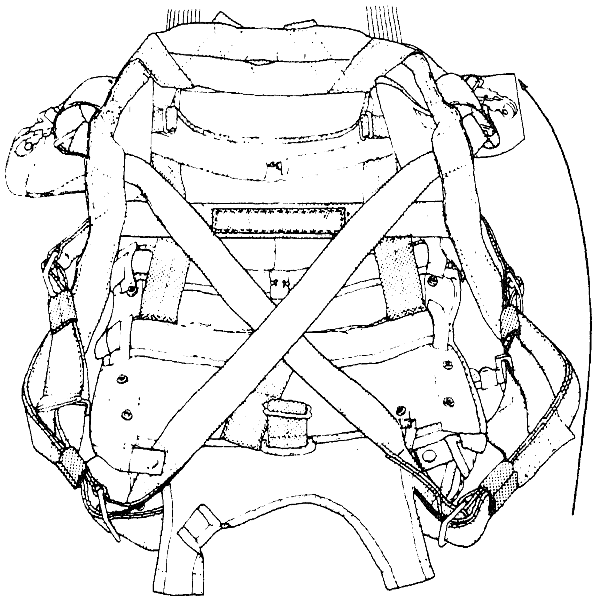


Figure 5-12.—Rotated harness (step 2).

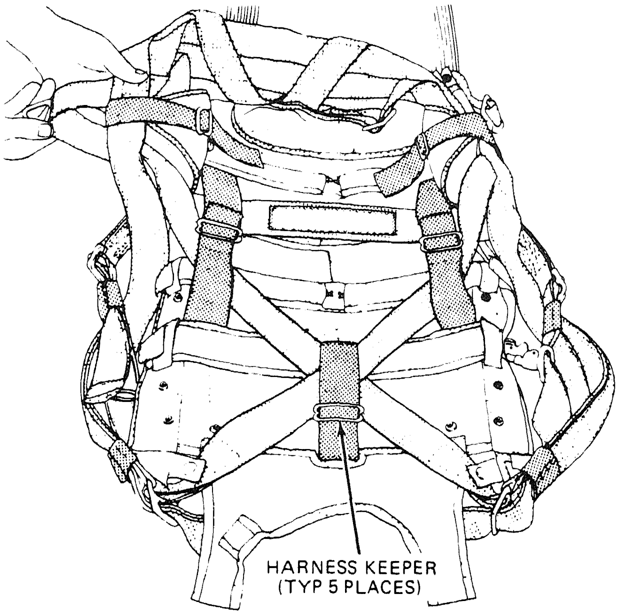


Figure 5-13.—Position of diagonal back straps (step 3).

and around the center bar of the adapter. Tie the ends with a surgeon's knot followed by a square knot (figure 5-14).

5. Reeve the raft retaining strap completely through the strap adapter and position the adapter against the main sling of the harness. Fold the strap-end approximately two inches back under and tack it to the strap beneath it using one turn of waxed nylon 6-cord (V-T-295), single. Tie the ends with a surgeon's knot followed by a square knot. Tack both straps together at the center, through the main sling. Use one turn of waxed nylon 6-cord, single. Tie the ends with a surgeon's knot followed by a square knot. Pass one turn of waxed nylon 6-cord, single, around each side of adapter center bar and through retaining straps. Tie the ends with a surgeon's knot followed by a square knot (figure 5-15).

6. Attach the back pad to the container, securing it with the six back-pad keepers.

7. Cut two 10-inch lengths of Type III nylon cord (MIL-C-5040). Remove and discard their inner cores and sear both ends of the remaining casing.

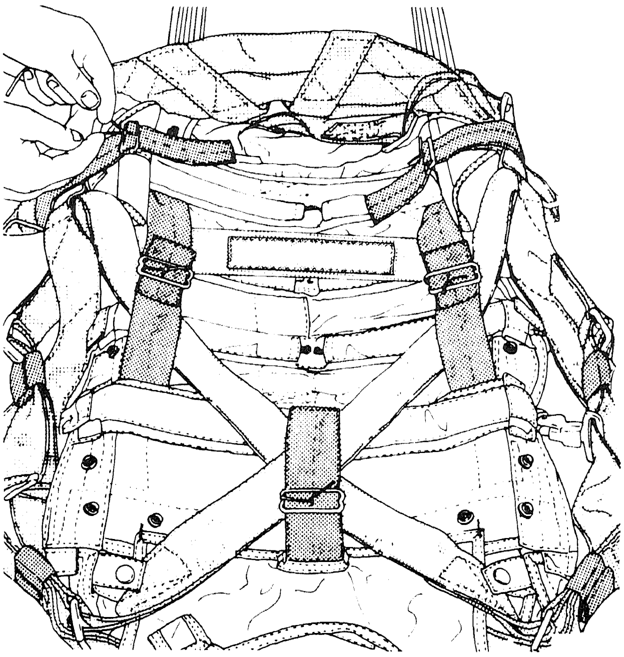


Figure 5-14.—Tacking keeper strap (step 4).

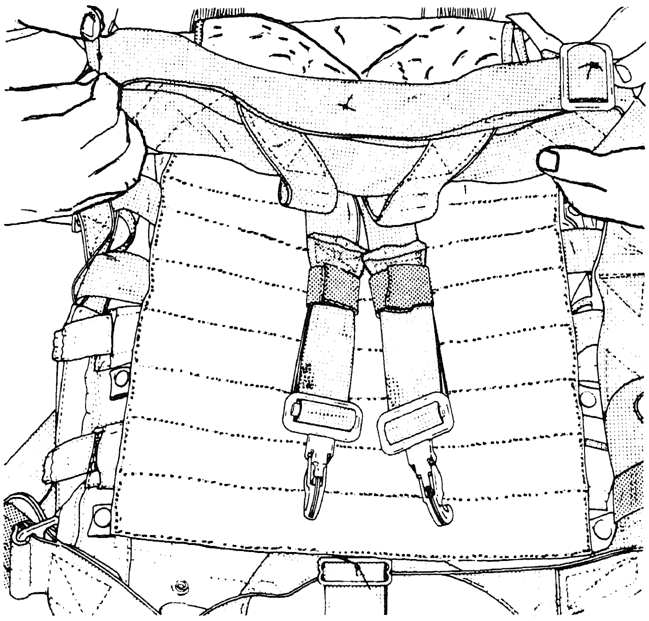


Figure 5-15.—Tacking raft retaining straps (step 5).

8. Use these lengths of cord casing to tie the shoulder tabs to the web loops which secure the center bar of each shoulder adapter (shown in figure 5-16). Tie the ends together with a square knot.

Attachment of Ripcord Housing to Container and Harness

The ripcord housing shall be 21 inches plus or minus 1/64 inch long.

To attach the ripcord housing to the harness:

1. Clamp one end of the ripcord housing to the base plate using a single housing clamp. Reeve the housing through the shoulder tab assembly sleeve. (See figure 5-17).

2. Insert the free end of the ripcord housing through the loop of the ripcord handle pocket and tack the housing to the pocket loop by using four turns of nylon 6-cord double. Tie the

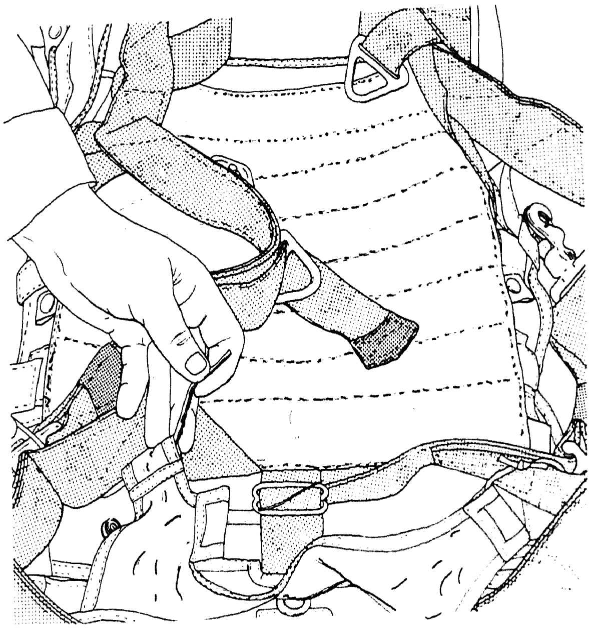


Figure 5-16.—Tying shoulder tabs (step 8).

two ends together with a surgeon's knot followed by a square knot. (See figure 5-18).

Once the ripcord pocket is secured about the harness, ensure that tackings A, B, and C are in place and secure. To accomplish this:

3. Fold the ripcord housing pocket around the harness webbing so that the ripcord housing is positioned on its inside edge. Tack both sides of the pocket together between the stiffener and the harness webbing and points "A" and "C". Use two turns of waxed nylon 6-cord (V-T-295), double. Tie the ends with a surgeon's knot followed by a square knot.

4. Tack both sides of the pocket together at point "B", between the harness and the stiffener, using a single turn of waxed nylon 6-cord, double. Tie the ends with a surgeon's knot followed by a square knot. The ripcord housing pocket shall be free to move up and down the harness webbing when attached.

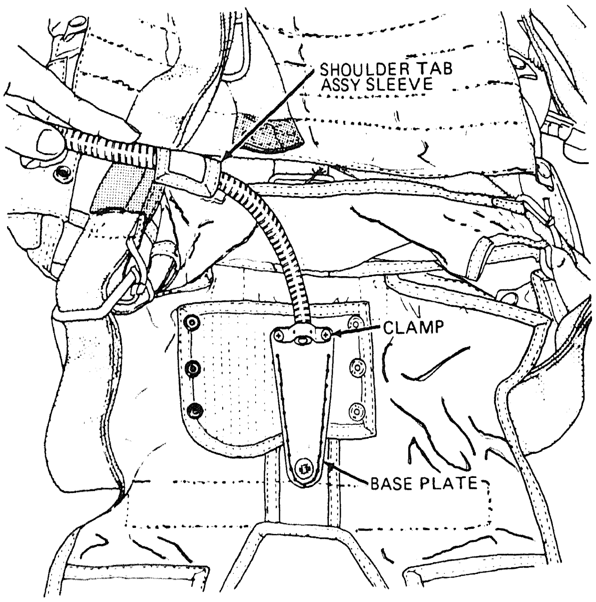


Figure 5-17.—Attaching ripcord housing to base plate.

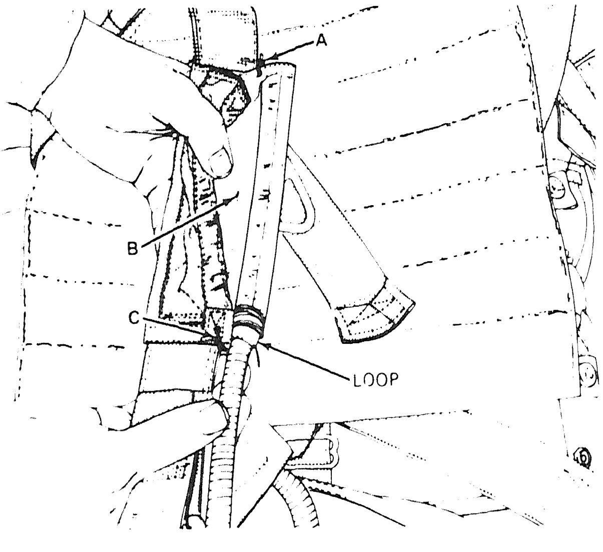


Figure 5-18.—Ripcord pocket tacking locations.

5. (CDI). Ensure ripcord housing pocket is free to move up and down harness webbing.

Now that you have properly rigged the NB-8, you are ready to pack the assembly. All parachutes have the same basic packing sequence.

PACKING PROCEDURES

All work on parachutes is done by following the step-by-step procedures listed in the Parachutes Manual, or the same procedures provided by the up-to-date set of shop process cards that we described previously. The procedures described here are general and intended to give you a broad view of how the canopy assembly is folded and stowed. Each type of parachute has its own characteristics which will cause differences in many of the steps that you follow when you pack it.

At the start of the packing procedure the canopy is laid out on the packing table with the tension straps in position. It should appear as in figure 5-19. You, the packer, are on the left side of the table and your helper is on the right. In the first step, your helper will straighten the vent hem. He does this by twining his fingers through the suspension lines and sliding the lines through the loop in the pilot chute connector cord until they are even, and the hem is straight and perpendicular to the length of the table. Straightening the vent has the effect of also straightening the skirt hem.

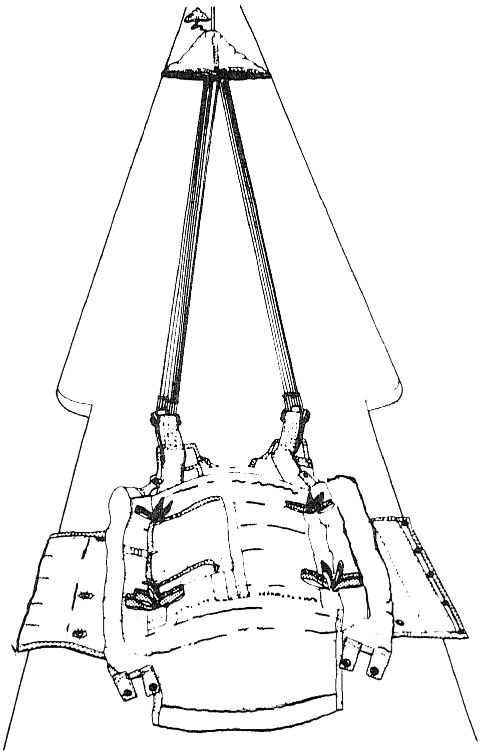


Figure 5-19.—Parachute under tension and ready for whipping and folding.

At this time you will want to adjust the tension on the assembly to the right amount for whipping. This tension should be enough to draw the suspension lines straight and into the center of the table, but not too much, because you will be holding the lines at shoulder level by the skirt hem while whipping and folding the canopy. With the right tension both you and your helper will be able to see the entire inside surface of a gore when it is held as shown in figure 5-20.

Now you are ready to whip and fold the canopy.

Whipping and Folding

The purpose of whipping and folding is to arrange the gores neatly and in such a way that no part of the canopy will interfere with another as the canopy inflates. You and your helper start by lifting the two top inboard lines. If the canopy was laid out as we described earlier in this

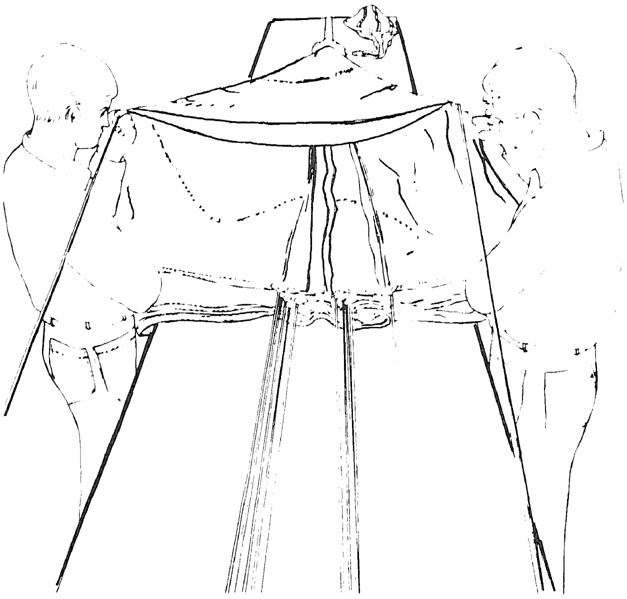


Figure 5-20.—Whipping and folding.

chapter, these lines will lead from the inside of the top connector links to the lower corners of the nameplate gore. As shown in figure 5-20 you raise these lines and the corner of the gore to about shoulder height, so that both of you can see all the way down the inside of the gore to the peak. Now go along the skirt hem to the next suspension line (figure 5-21). Pick up this line with your right hand and swing it in a wide arc away from yourself and toward your helper, ending by collecting it in your left hand with the first line. Your helper does the same with his second line. Look inside the canopy to be sure all of the material of the gore has fallen outside the line; you should see the seam all the way to the peak. Repeat this procedure for all except the last two lines. Now all the gores have been folded outward except the two gores at the top and bottom as shown in figure 5-22.

Bring the suspension lines in your left hand down to the side of the table while your helper does the same with the lines in his right hand. The folds are now hanging over the side of the table. Each of you should hold the lines as shown in figure 5-23, and with your free hand take the group of folds at their outer edge and move them up and down in a whipping motion. This will shake out most of the wrinkles put into the fabric by the folding action.

To fold the last two gores you must reach over the top of the lines with your right hand and grasp the center of the top gore. Your helper reaches under his group of lines with his right hand and grasps the center of the hem of the bottom gore. This position is shown in figure 5-24. When you give the signal, both of you swing your groups of suspension lines toward the center of the table while at the same time pulling the top and bottom gores to the outer edge of the table, as shown in figure 5-25.

Insert the suspension lines into the slots of a suspension line holder, and place a shot bag across the lines. You and your helper can now let go of the suspension lines.

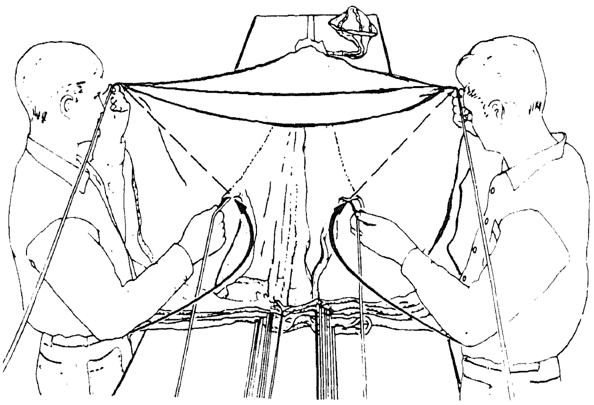


Figure 5-21.—Whipping and folding.

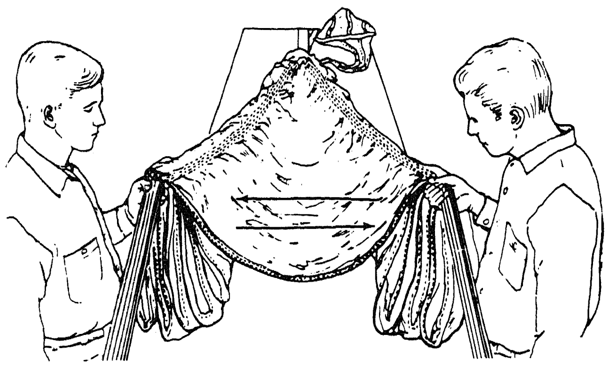


Figure 5-22.—Whipping and folding.

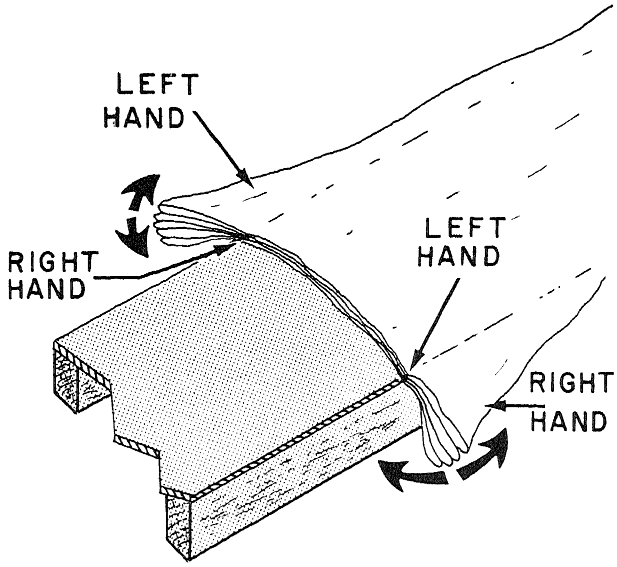


Figure 5-23.—Whipping and folding.

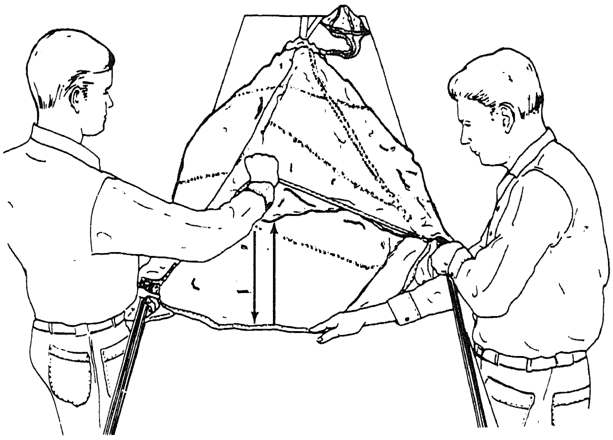


Figure 5-24.—Whipping and folding.

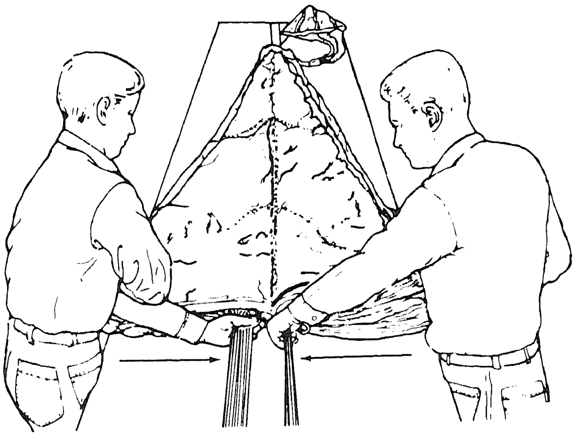


Figure 5-25.—Completing last two folds of canopy. (A) Gores being grasped in the center prior to moving suspension lines to center of table; (B) lines brought to the center and skirt hem folds towards table edge.

Since the last fold on the helper's side was the one he made under the other folded gores you now have to get down to it and straighten it out. Hold down the folds on your side with a shot bag and, one at a time, whip each of the gores from the helper's side of the table over to your side; except for the last gore. The helper must straighten this one out throughout its length. When he reaches the peak you should return the folds to his side of the table while he straightens and smooths out each one. When you get down to the shot bag, shift it to the other side. Take all of the gores on your side except the bottom one. Rotate them as a group over to the right side of the table. Straighten and smooth the bottom gore, and each of the others as your helper returns them to your side. With the folded gores straight and smooth you are ready to straighten and align the skirt hem.

Straightening the Skirt Hem

To straighten the hem fold the bottom corners of the gores back as shown in figure 5-26. Carefully bring each gore back into position as shown in figure 5-27. Count the folds; there

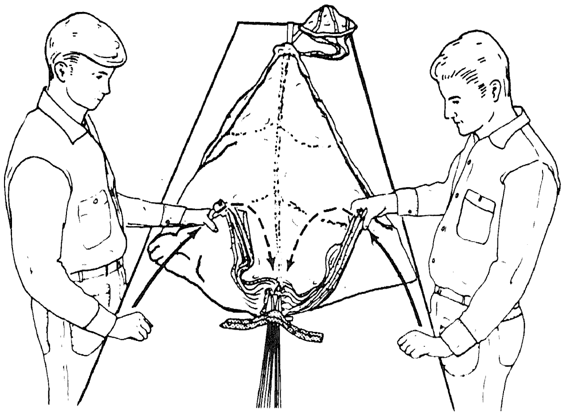
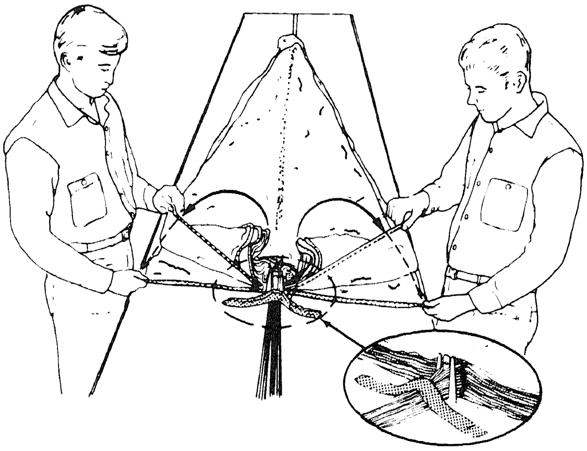


Figure 5-26.—Straightening the hem.



VIEW AFTER COUNTING AND ALIGNMENT

Figure 5-27.—Alining and counting the gores at the skirt hem.

should be 14 on each side if the canopy has 28 gores. Align all the V tab reinforcements on top of each other in the same direction; the hems should be straight. Now the canopy can be folded to its proper width.

Folding to Proper Width

To make the canopy the proper width for the container it must be folded as shown in figure 5-28. The final width of the canopy will vary with different sizes of containers. To do this, you first place your hand on the helper's side of the skirt hem. Using your hand as a pivot, your helper folds the gores over your hand toward you, creating a fold parallel to the edge of the table. Next, the helper places his hand on the hem on the opposite side, and you rotate the gores on your side over toward him, so the folds overlap or butt, depending on how wide the folded canopy is required to be. Note, the canopy cannot be folded throughout its entire length, but breaks at approximately 2/3 of the distance of the peak. To hold things in place put one shot bag slightly behind the skirt hem at the lower part of the canopy and another across the middle of the canopy. You can now take the tension strap off and place the pilot parachute on top of the canopy. Before you fold the canopy any more you have to stow the suspension lines in the container.

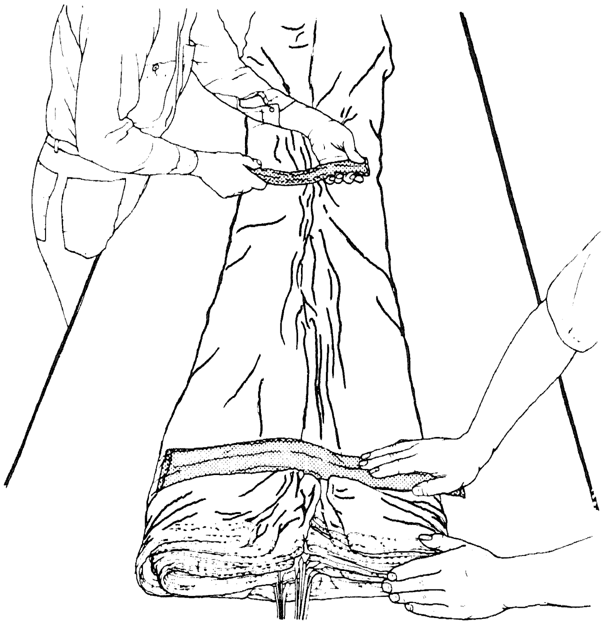


Figure 5-28.—Folding the canopy.

Stowing Suspension Lines

Whenever a coiled line is straightened out rapidly it has a very strong tendency to twist and kink, and the kinks turn into knots. This tendency can only be prevented and controlled by carefully making the line up so it is free to run without twisting and so that it is released under enough tension to keep it straight as it plays out. Since it is vital for parachute suspension lines to stretch out without knots or snarls, care must be taken in stowing them in the container, and specially constructed devices are used to control their run-out.

The stowage of suspension lines must do the following:

a. Hold the lines neatly and securely so they do not become twisted while in the packed position.

b. Avoid coiled conditions that permit parts of the line to cross each other as the line is released.

c. Maintain control of the lines as they are pulled from their stowed position.

To do this the lines are stowed in a series of bights, or what might be called "S" or zigzag folds, rather than coiled. Some containers retain these bights or folds in place with an arrangement of cloth loops and rubber bands. Others, which are covered later in this text, stow the lines in a rack of plastic tubes.

The parachute we are discussing has a pack with a series of hesitator loops, which hold the suspension lines. As the canopy deploys, one bight of line after another is pulled from the loops which keep enough tension on the lines to ensure they run out straight.

To get the suspension lines neatly packed you must take the right length of lines into each bight you make. Your shop process cards will tell you exactly how much. In this case the first bight is made by taking about 21 ± 3 inches of the lines, measured from the connector links. Grasp the lines as illustrated in figure 5-29. You will draw the canopy down the table just enough to get enough slack for each bight as it is formed; keep the suspension lines straight to the canopy with a gentle tension as you stow them. Your helper will use the packing hook to pull the first bight through the hesitator loop on his side. There should be equal lengths of suspension lines between this bight and your hand. The end of the bight, once pulled through the hesitator loop, should be pulled 3/8 of an inch beyond the hesitator loop. (See figure 5-29.) Check to make sure all the lines have been pulled through the loop, then make another bight and secure it in the same way on the other side of the pack. Continue doubling the suspension lines back and forth across the pack as shown in figure 5-30 until all the loops have been used and the canopy hem is from 18 to 24 inches from the last stowed bight. Make sure all lines are neat and remove all wrinkles from the hesitator loops using the temporary locking pin as shown in figure 5-30. Now you are ready to finish folding the canopy and to stow it in the pack.

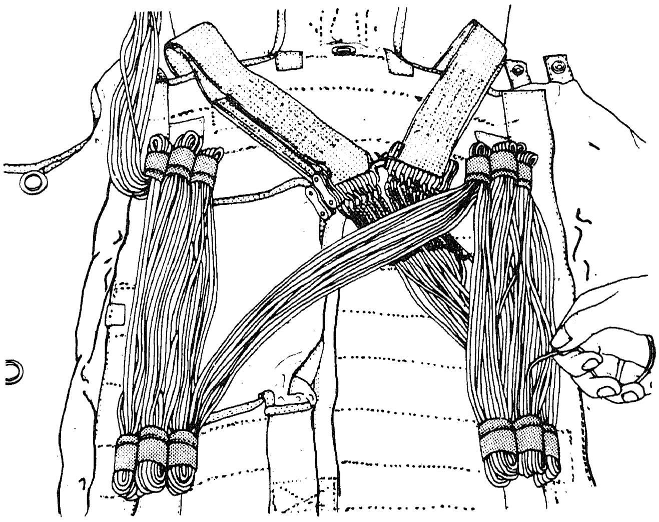


Figure 5-30.—Stowing suspension lines.

Your helper shall place a long bar over the suspension lines at the center of the container. You, as the packer, shall grasp the canopy skirt hem on each side of the suspension lines and draw the canopy across the container as shown in figure 5-31. Place the skirt hem even with the bottom of

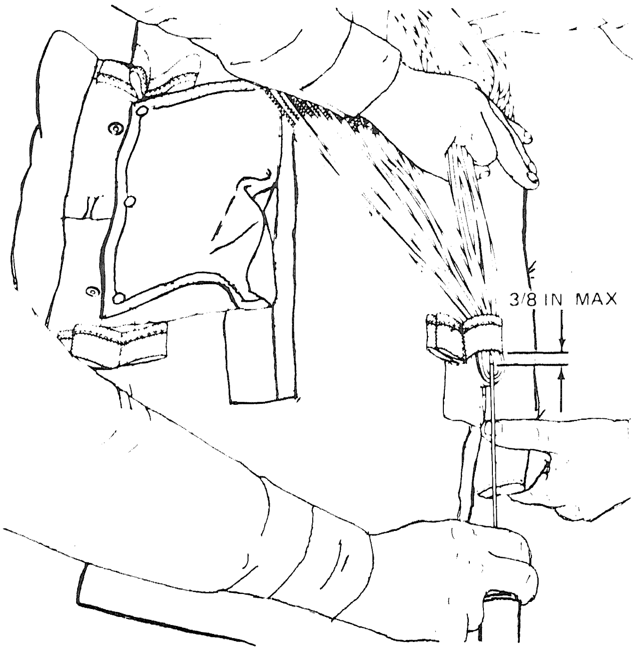


Figure 5-29.—Grasping the suspension lines.

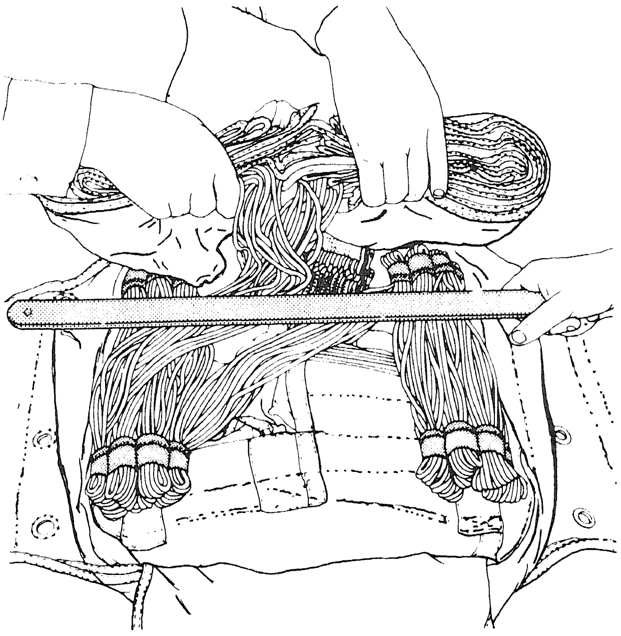


Figure 5-31.—Stowing canopy.

the container edge. Spread the canopy so it overlaps the sides of the container 2 inches on each side. This is shown in figure 5-32. Continue accordian-folding the remainder of the canopy into the container. Remember to maintain a 2 inch canopy spread over the sides of the container. This overlap is left to ensure that after you close the container the parachute assembly will be solid without any soft spots or holes in the packing.

When insufficient canopy remains to complete a fold, approximately 9 inches will be folded under the last fold. See figure 5-33.

As you prepare to place the pilot chute into the container you have to use a special tool called a guide tube. By placing the guide tube through the grommet at the peak of the pilot chute and fitting it around the locking cone located at the base of the spring plate, you can compress the pilot chute spring and allow the locking cone to protrude through the grommet. See figure 5-34.

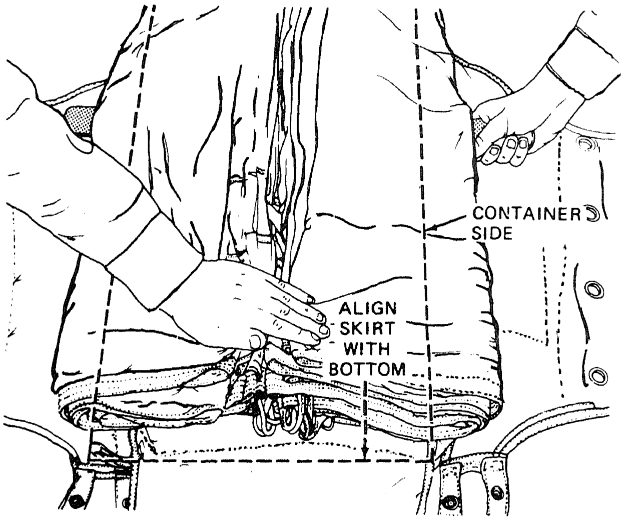


Figure 5-32.—Stowing canopy.

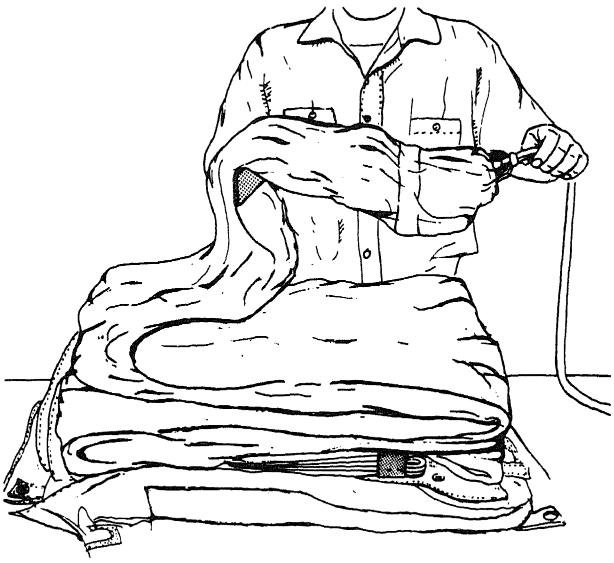


Figure 5-33.—Stowing canopy.

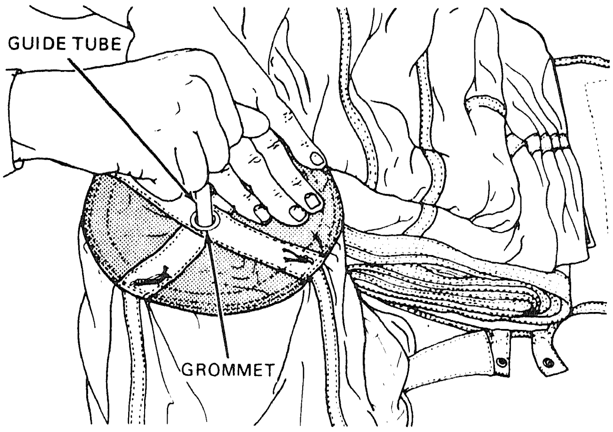


Figure 5-34.—Compressing the pilot chute.

CAUTION

Ensure that the pilot parachute is not twisted around, or entangled in the compressed pilot parachute spring.

Compress the pilot parachute spring and remove the guide tube from the locking cone.

Insert the temporary locking pin plate into the bottom hole of the locking cone.

Rotate the parachute container 90° counterclockwise.

Place the pilot parachute on top of the canopy with the pin plate positioned on your helper's side of the packing table. Align the pilot parachute locking cone with the second side flap grommet from the bottom end of the container. Roll the pilot parachute cloth under the outer edge of the crown.

By rolling the pilot parachute cloth under the outer edge of the crown of the pilot chute you will have no problem placing the pilot chute into the container.

Closing of Parachute Container

To close the parachute container, proceed as follows:

You and your helper shall hold the canopy and compressed pilot parachute in place and pull the container side flap with the locking cone over the canopy. Lace the second grommet from the container bottom over the locking cone in the pilot parachute.

You and your helper shall pull the container side flap with grommets over the canopy while holding the side flap with the locking cone in place. Keep the canopy and pilot parachute movement to a minimum.

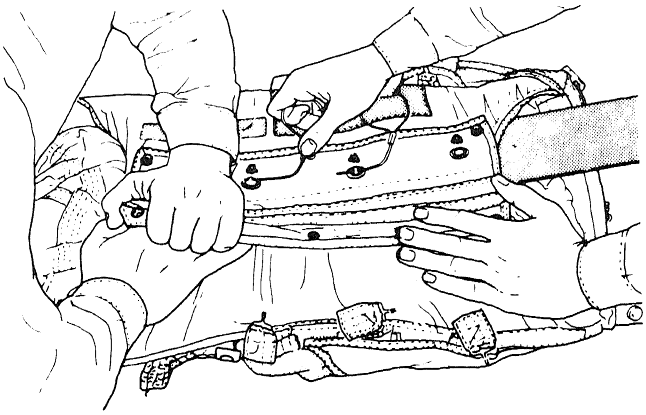


Figure 5-35.—Closing the container.

Place the grommets over the locking cones and insert temporary locking pins. Note direction of locking pins shown in figure 5-35.

Remove the temporary locking pin plate from the pilot parachute locking cone and straighten the canopy folds at both ends of the container.

The packer shall tuck the top container end flap under the side flaps using two long bars inserted into the pockets.

Place the grommets on each side flap over the top end flap locking cone and insert a temporary locking pin from the proper direction. See figure 5-36.

The bottom end flap is tucked in and secured in the same manner.

Push the lift web protector flaps into the container using packing fid inserted into the pockets. Remove wrinkles and smooth corners of the container using a packing fid.

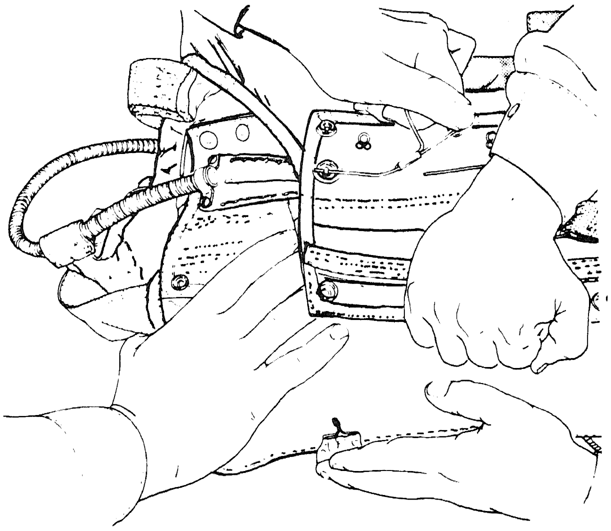


Figure 5-36.—Closing the container.

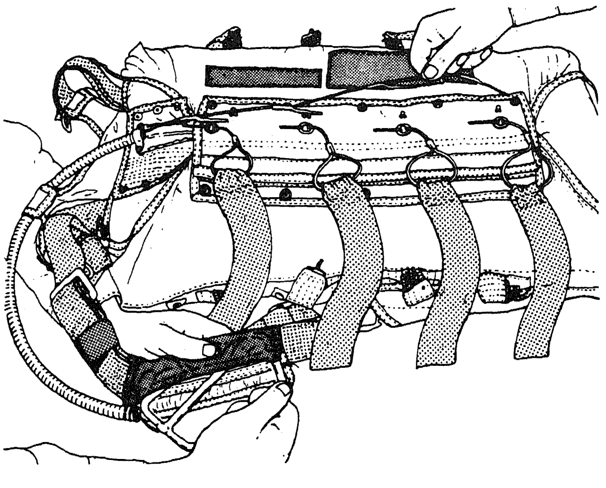


Figure 5-37.—Closing the container.

Insert the ripcord cable assembly into the ripcord housing and insert handle into the pocket. See figure 5-37.

By removing the temporary locking pins one at a time you can replace them with the ripcord pins. See figure 5-38. Now you can turn the container over and fasten the corner keepers.

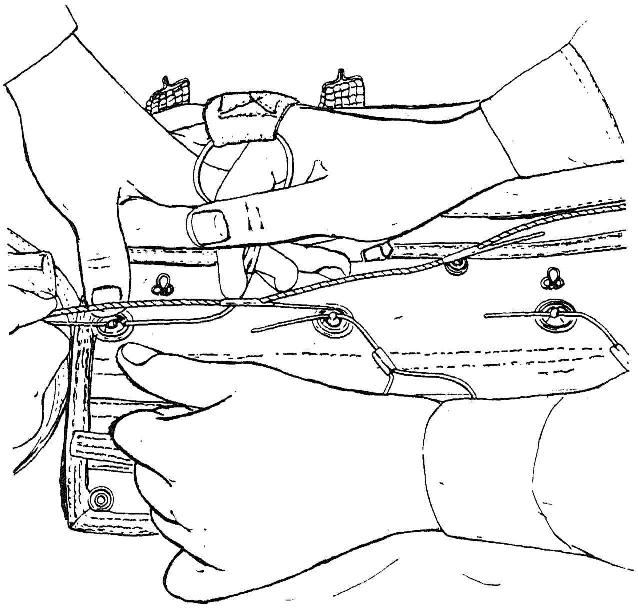


Figure 5-38.—Closing the container.

Attach the container spring opening bands to the container eyes, inventory all tools and complete the signing of the History Card. This completes the packing. For final inspection by the CDI refer to the NAVAIR 13-1-6.2.

CHAPTER 6

NES 12 PERSONNEL PARACHUTE SYSTEM

The modern high-performance aircraft used by the Navy today make extreme demands of emergency escape devices. The most critical time for ejection from aircraft is at low altitudes—especially on takeoffs and landings. The ultimate goal in seat performance to which engineers have been working is one that safely ejects the occupant at zero airspeed and at zero altitude, at low altitudes under high speed, or under other adverse conditions. The system discussed in this chapter gives the aircrewman a zero airspeed and a zero altitude ejection system.

The 1G series ejection seats positively separate from the aircrewman by means of a lanyard that forcibly propels the seat away from the crewmember after ejection.

After the crewman ejects from the aircraft, a static line on the outside of the container pulls the external pilot chute from its pocket and opens it. The sequence of events shown in figure 6-1 commences. This static line is also attached to the arming cable for the automatic opening device. The external pilot chute is intended to cause the parachute to open more rapidly, especially at low altitudes or during ground-level ejection. It is of a tri-mode design and functions as follows: at speeds from 0 to 90 knots, it will inflate to full diameter; at speeds between 90 to 250 knots, the full diameter will reduce to 24 inches; and at speeds in excess of 250 knots, it will invert, but its effective drag will be sufficient to extract the internal pilot parachute and the main canopy.

At a preset altitude, the automatic actuator fires, pulling the ripcord pins from the locking cones, allowing the spring opening bands to open the container. The internal pilot parachute springs from the container and fills with air during this operation. The external pilot chute release assembly frees the shear link cable when the container opens.

The internal pilot parachute causes the main canopy to be pulled from the container, followed by the suspension lines. A short piece of 18-pound nylon tape is used to momentarily shorten the canopy's effective length during low speed ejection, which in turn promotes more positive opening characteristics. Just prior to full suspension line stretch, the ballistic spreading gun fires, forcing the suspension lines out at the skirt hem. This rapidly opens the canopy and allows it to fill with air faster. Ties on the connector links break as load is applied, allowing the risers to be pulled from the container.

NOTE: If the spreading gun fails to fire, the slugs separate from the gun assembly at full suspension line stretch allowing the canopy to open aerodynamically.

The aircrewman hangs suspended in his harness from the quick-release shoulder fittings during descent. The parachute has the four line release system that was described previously. By manually actuating this system, the aircrewman is able to maneuver the parachute to a less hazardous landing site and to reduce oscillation during descent. Upon landing, the canopy and suspension lines can be disengaged from the integrated torso suit by means of the quick-release shoulder fittings.

If the aircrewman should have to manually separate from the seat and initiate the parachute operation, only the internal pilot parachute will deploy the main canopy. The external pilot chute bridle is disconnected by means of the external pilot parachute override disconnect assembly discussed later in this chapter.

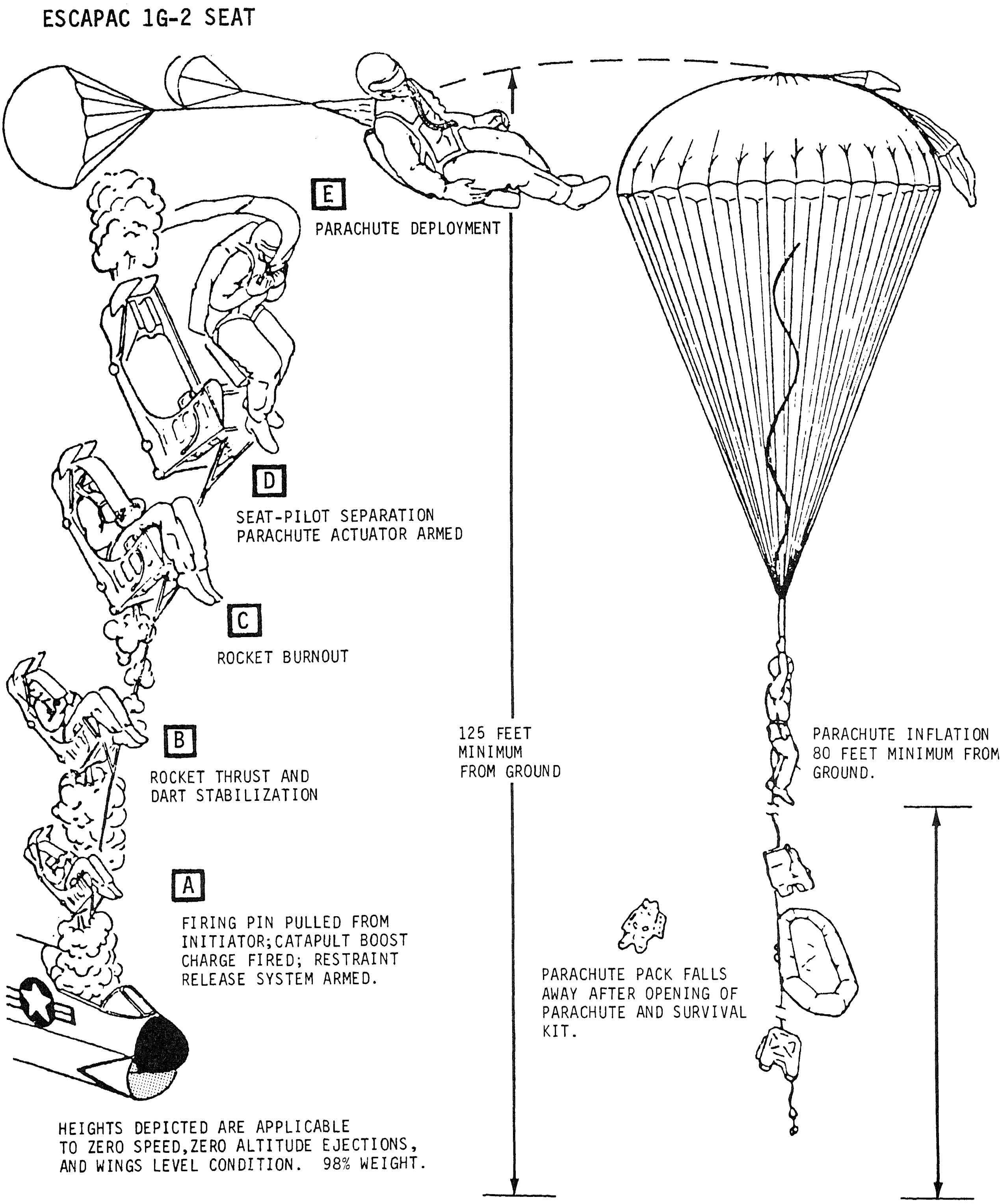


Figure 6-1.—Ejection system sequence of events.

The NES-12 Personnel Parachute (figure 6-2) is a back-type parachute used with an integrated torso harness suit as part of an ejection seat escape system.

The NES-12 Parachute Assemblies include a modified 28-foot diameter, flat nylon canopy with 28 gores. A ballistic spreading gun is used to rapidly deploy the canopy. The canopy is packed in a semi-rigid contoured container. These assemblies also include the tri-mode external pilot chute (EPC) and an internal pilot chute. The riser assembly, which includes the shoulder restraint

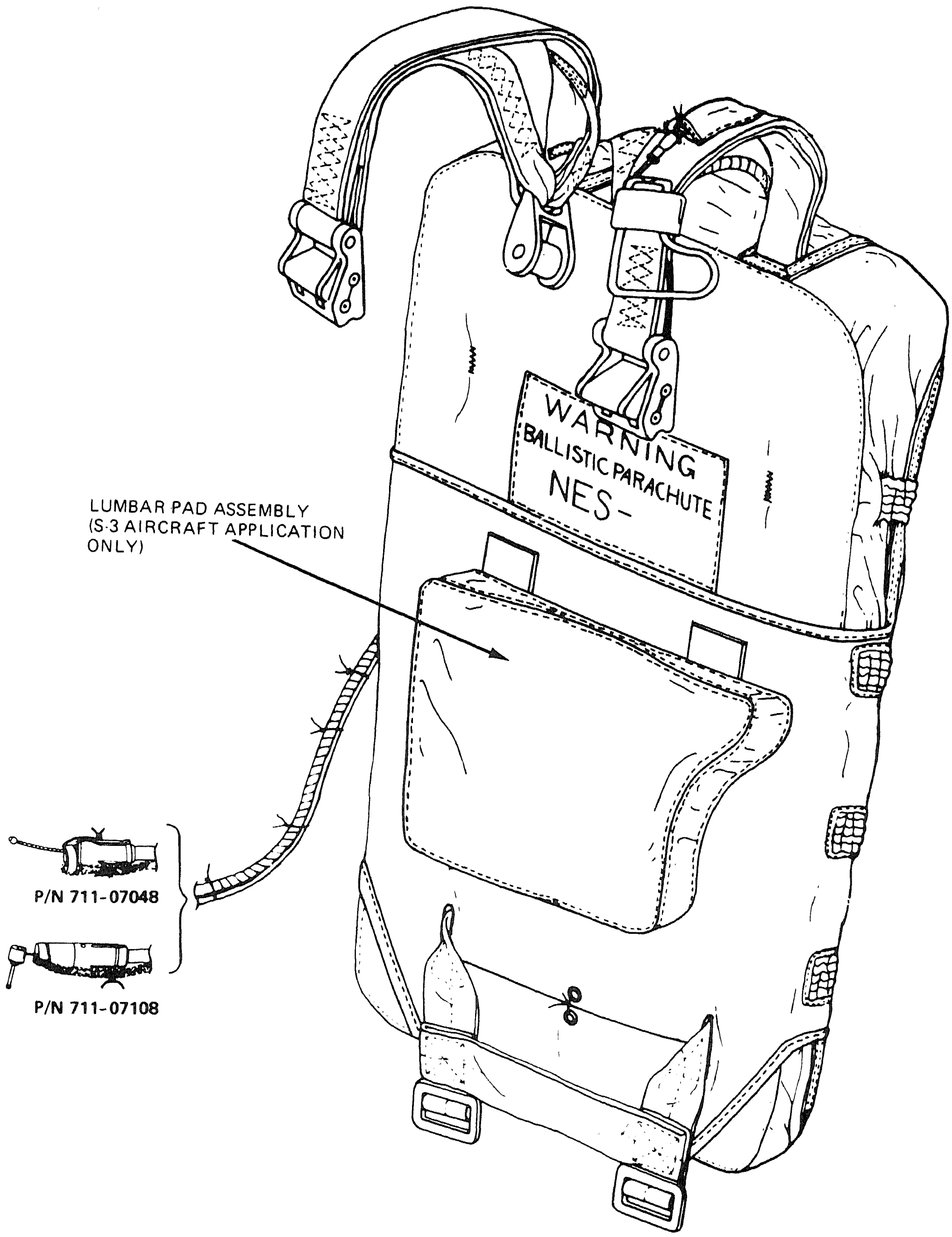


Figure 6-2.—NES-12 personnel parachute assemblies.

system, is rigged to the container and is connected to the torso harness suit with quick-release fittings. The integrated torso harness suit combines the aircrewman's parachute harness and lap and shoulder restraint straps. The harness is channeled through the torso suit to retain it in position and to facilitate donning. When aboard the aircraft and seated, the aircrewman connects the quick-release fittings on the parachute riser assembly to the quick-release shoulder fittings on the integrated torso suit. The survival kit and the lap restraint system are also connected to the integrated torso suit by means of quick-release fittings.

RIGGING

To obtain a NES 12 parachute, you order each component separately. You must rig the parts together to form a complete assembly. When you start to work on this or any parachute, the rigging and packing will be done under ideal conditions in a parachute loft. When a parachute assembly must be packed under unfavorable conditions, provisions must be made to protect it from possible damage and excessive humidity. Collateral Duty Inspection (CDI) points are included in rigging and packing procedures. When a step is underlined, there is a CDI requirement. All work shall stop until a collateral duty inspector has performed the requirements listed at the end of the applicable paragraph.

In no case shall the packing of a parachute assembly be interrupted after the packing operation has been started. If due to unforeseen circumstances the packing operation is interrupted, the parachute assembly shall be completely repacked.

The rigging covered in this chapter applies to an original issue parachute assembly.

PRELIMINARY PROCEDURES

To prepare the parachute assembly for rigging follow the basic procedures described in the previous chapter.

After you have laid out the parachute and connected the connector links to the proper tension hooks, attach the internal pilot parachute. This is done by routing the small loop of the bridle assembly through the loop in the pilot parachute. Pass the free end (large loop) of the bridle assembly through the small loop, forming a lark's head knot. Draw it tight. Pass one free end (large loop) of the bridle assembly around the canopy vent lines at the peak of the canopy. Pass the pilot parachute through the large loop of the bridle assembly, forming a lark's head knot, and draw tight.

Now, attach a tension strap to the canopy vent lines and tighten it.

At this time, you should inspect the complete parachute assembly following the directions in NAVAIR 13-1-6.2. This inspection has been covered in Chapter 3 of this manual.

INSTALLATION OF SPREADING GUN

A ballistic spreading gun (shown in figure 6-3) is used in the parachute. The procedures for inspecting this device was discussed in Chapter 4. After the parachute has been inspected and

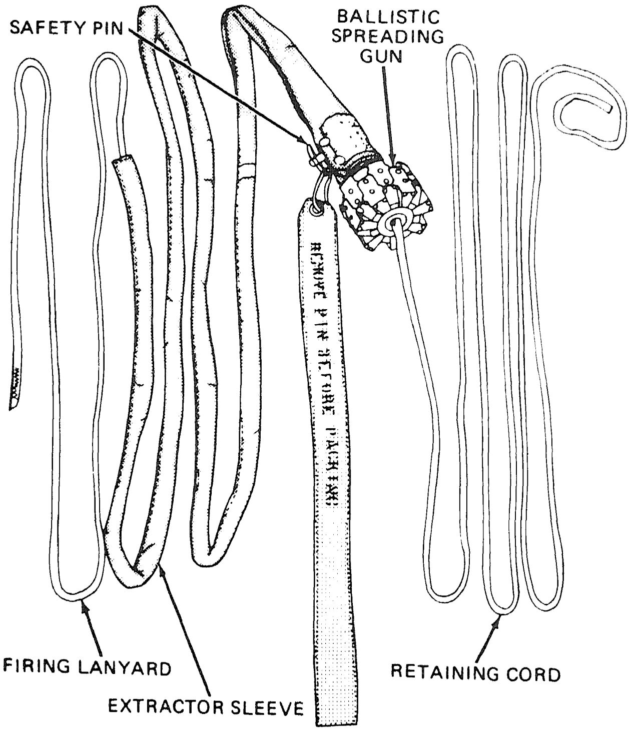


Figure 6-3.—Ballistic spreading gun assembly.

rigged, you will install the spreading gun using the following procedures:

Before commencing any further operations, ensure that the safety-pin is installed in the spreading gun.

Position the spreading gun between the suspension line groups 1 through 14 and 15 through 28 so the retaining cord of the gun faces the canopy. Remove the tension strap from the canopy peak.

Tie a piece of Type III nylon suspension line 20 feet long to a shot bag (figure 6-4).

First throw the shot bag attached to the line through the canopy gores so that it reaches the canopy peak. Then pull the shot bag through the vent hem and tie the line temporarily to the vent lines. Secure the bottom end of this line to keep it in place while you whip and fold the canopy. When the canopy has been whipped and folded, tie the free end of this line to the end of the spreading gun retaining cord and pull the retaining cord through the canopy and out the peak.

Untie the Type III nylon line from the retaining cord and vent lines, and route the retaining cord through the lark's head knot in the pilot parachute connector strap and under all the vent lines. The retaining cord has a plastic sleeve which should be centered over the indexing line on the retaining cord. Align the indexing line on the retaining cord above the vent lines.

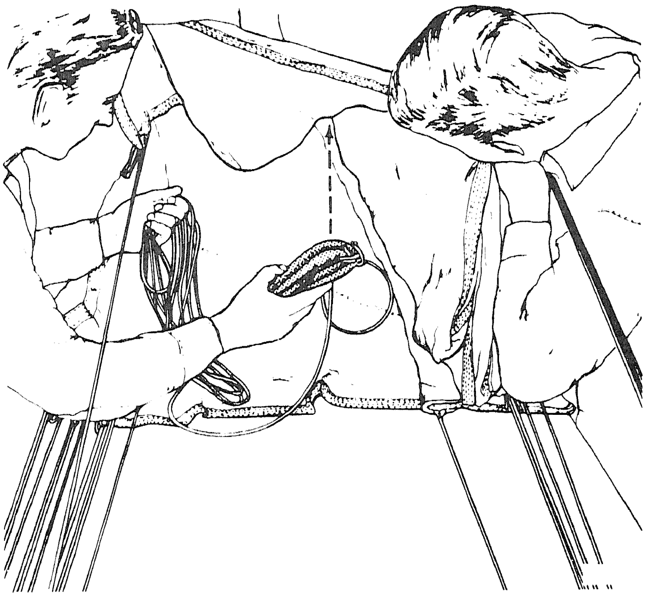


Figure 6-4.—Routing line for pulling retaining cord through canopy.

With the help of a bodkin tool, telescope 2 inches of the retaining cord into itself to form a 3 ± 1/4 inch loop around the vent lines and connector strap, as shown in figure 6-5. Cut 1 inch off the end of the retaining cord at a 45 degree angle.

Tie a half-hitch around the retaining cord and complete the splice by telescoping the remainder of the end into the retaining cord as shown in figure 6-6. Work the line

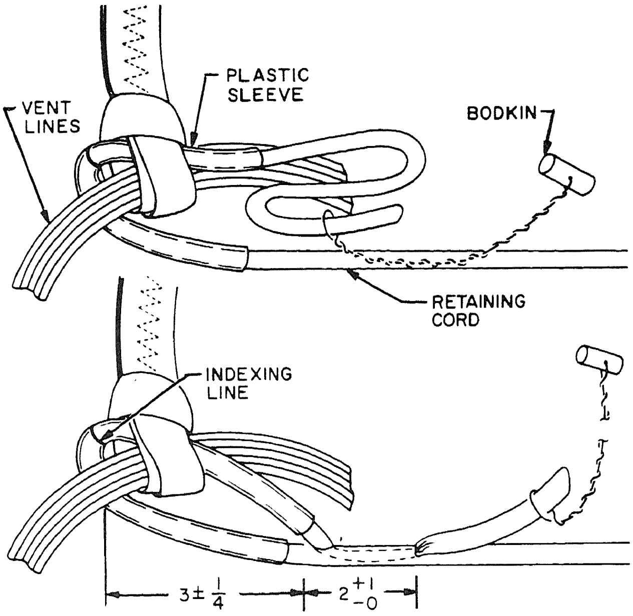


Figure 6-5.—Rigging retaining cord.

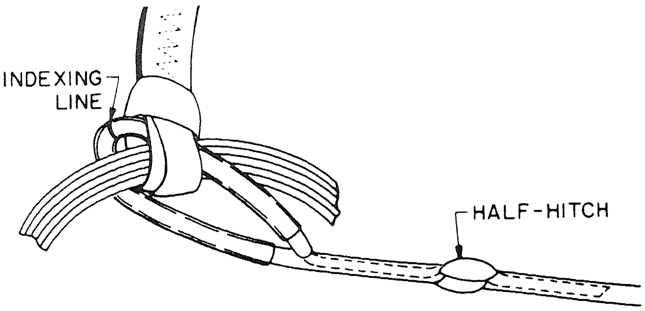


Figure 6-6.—Rigging retaining cord (completed splice).

until it becomes smooth on the inside of its casing.

Tack the end inside the retaining cord with two turns of waxed nylon 6-cord, single. Tie the ends with a surgeon's knot followed by a square knot.

Now position the spreading gun at the skirt hem.

Rotate the gun so the slug labeled "14-13" is facing up, and loosen the screws and plate on this slug. You will find two slots on the face of each slug. One is "closed" or covered when the plate is in place. The other is open to the side of the slug (see figure 6-7). Place suspension line number 13 and one side of the loop of line attached to the canopy hem in the closed slot of the slug (figure 6-8). Place suspension line 14 in the open slot of the same slug.

Pass the loop around the plate and over the suspension line in the slug. Secure the plate to the slug with screws and ensure the suspension lines move freely in the slots. Torque the plate screws to 6 (plus or minus 1/2) pound-inches and apply red tamper dot.

Secure the remainder of the suspension lines and loops to corresponding slugs in the same manner. Work from suspension line 12 through 1 and from line 15 through 28 (see figure 6-9).

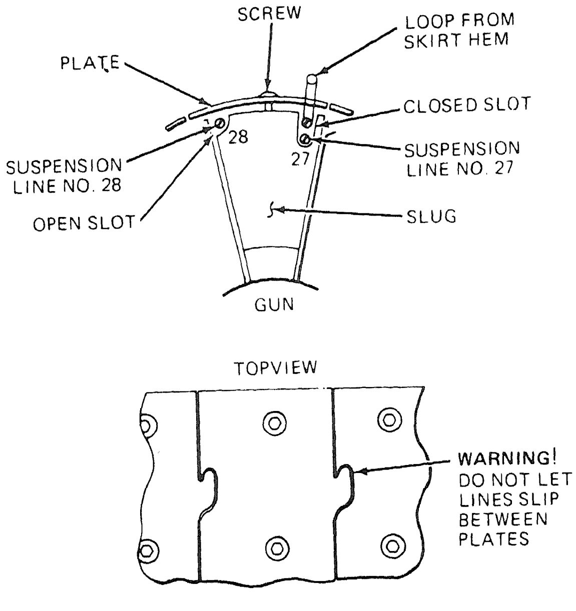


Figure 6-7.—Loosening screws on slugs.

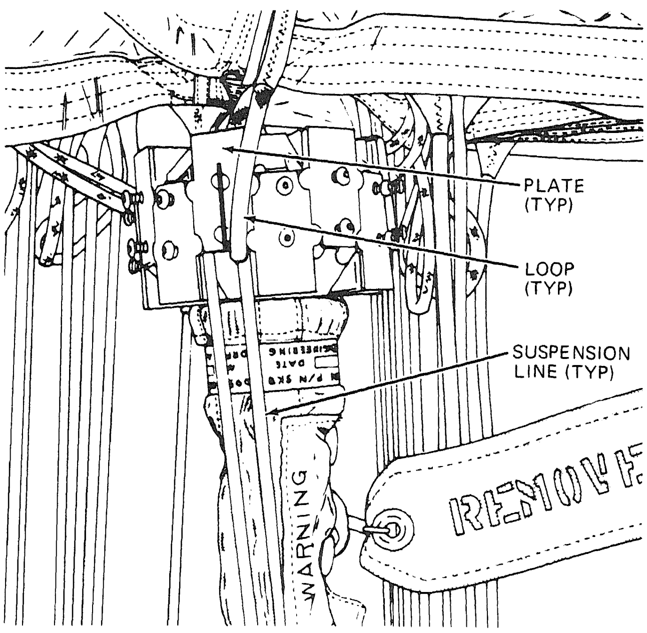


Figure 6-8.—Installing suspension lines.

At this time you must have a CDI inspect the completed installation of the spreading gun.

THE EXTERNAL PILOT PARACHUTE

A special feature of the NES-12 parachute is the external pilot parachute. You were explained the function of this pilot chute at the beginning of the chapter. To function properly, the external parachute is connected to the cord that links the internal pilot chute to the main canopy vent lines. A special device is used to jettison the external chute at high speeds. This device is the override disconnect assembly, shown in figure 6-10. It consists of two hooks or sears that are kept in engagement as long as they are inside the barrel.

As long as tension is applied to the external pilot chute connection, the override will remain locked. Once the internal pilot chute takes control of the tension, the override connection will release or unlock allowing the external pilot chute to be released.

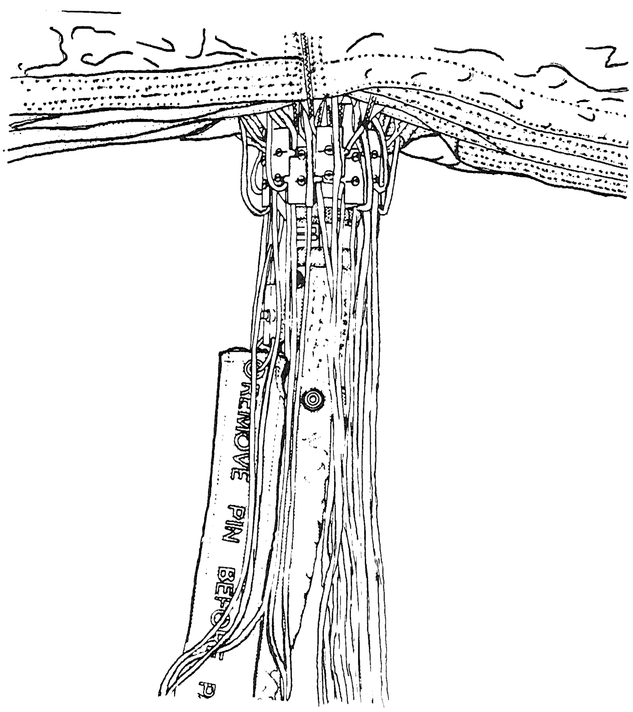


Figure 6-9.—Complete set of suspension lines.

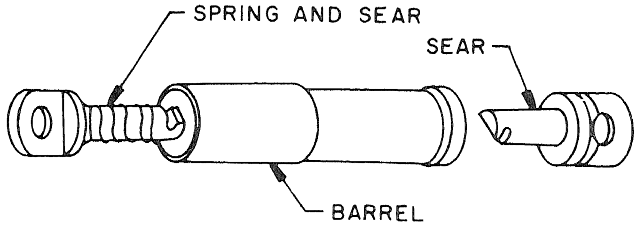


Figure 6-10.—Override disconnect.

To attach the external pilot parachute, proceed as follows:

1. Insert the spring and sear (shown in figure 6-10) into the wide end of the barrel assembly of the override disconnect. The spring and sear will be connected to the external pilot chute bridle shown in figure 6-11. With the aid of a temporary locking pin, push the sear into the barrel until it is protruding from the other end.
2. Engage the sear attached to the internal pilot chute connector cord with the sear which is protruding from the override disconnect and release the tension by removing the temporary locking pin. This will cause the two sears to lock within the barrel assembly of the override disconnect. As you can see in figure 6-11, the external and internal pilot chutes are now locked together.

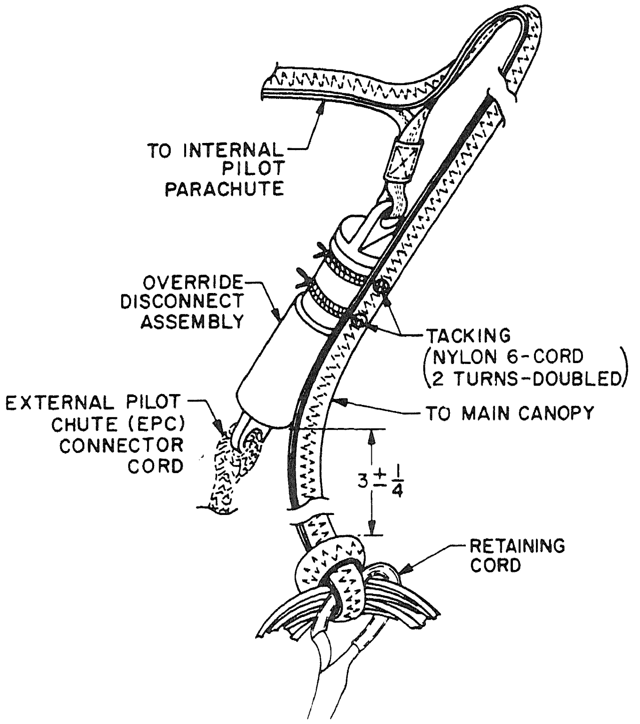

TO INTERNAL PILOT PARACHUTE
OVERRIDE DISCONNECT ASSEMBLY
TACKING (NYLON 6-CORD 2 TURNS-DOUBLED)
EXTERNAL PILOT CHUTE (EPC) CONNECTOR CORD
TO MAIN CANOPY
3 ± 1/4
RETAINING CORD

Figure 6-11.—Tacking override disconnect.

3. Tack the override disconnect to the internal pilot parachute connector strap 3 inches (plus or minus 1/4) above the knot securing the connector strap to the vent lines at two places. Use two turns of waxed nylon 6-cord (V-T-295), double, for each tacking. Tie the ends with a surgeon's knot followed by a square knot.

SUSPENSION LINE CONTINUITY CHECK WITH SPREADING GUN INSTALLED

Although you have checked the continuity of suspension lines prior to installing the spreader gun, they must be checked again to ensure that you haven't gotten any lines out of sequence or have crossed a line causing a twist. To check suspension lines continuity, proceed as follows:

WARNING

Ensure the safety pin is installed in the spreading gun (figure 6-12).

If the canopy isn't already under tension, attach a tension strap hook to the canopy vent lines and tighten.

The suspension line shall be arranged on the connector links as shown in figure 6-13 and on the spreader gun as shown in figure 6-14. The spreader gun shall be turned so that suspension lines 15 and 14 face up. The suspension lines shall pass through corresponding numbered slots in the spreading gun slugs. Ensure that the loops attached to the odd numbered suspension lines pass through the slots in the odd number of slugs.

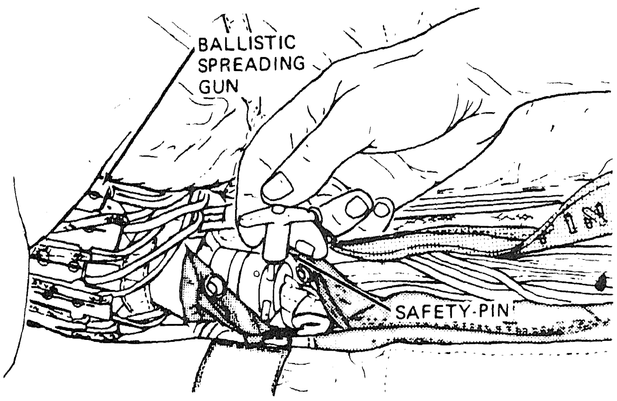


Figure 6-12.—Inserting safety pin.

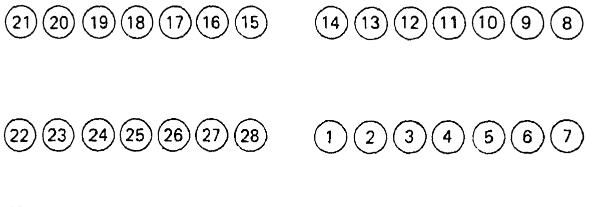


Figure 6-13.—Arrangement of suspension lines on connector links.

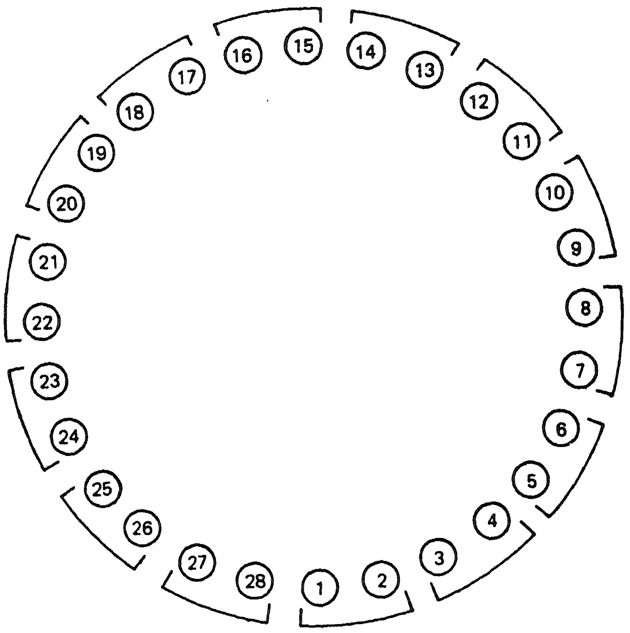


Figure 6-14.—Arrangement of suspension lines on spreading gun.

Suspension lines shall run free from the skirt hem, through the corresponding numbered slot in the spreading gun slugs, and to the connector links without any dips or twists.

STRAIGHTENING CANOPY GORES WITH SPREADER GUN INSTALLED

It would be impossible for you to whip and fold a canopy with a spreading gun installed. For this reason you will have to straighten the gores instead of whipping and folding. Always ensure the safety-pin is installed in the spreading gun and the spreading gun firing lanyard is detached from the connector link.

1. The helper shall place a shot bag on the helper's side of the skirt hem.
2. The packer shall rotate all gores on the packer's side as a group, except the bottom gore; it goes over to the helper's side of the packing table. The packer shall straighten and smooth the bottom gore on the packer's side of the table throughout its length to the peak.

3. The packer shall return each gore above the shot bag on the helper's side of the packing table to the packer's side, one at a time. Each fold shall be straightened and smoothed as shown in figure 6-15.

4. The folded gores on the helper's side shall be straightened and smoothed in the same manner.

STOWAGE OF FIRING LANYARD INTO EXTRACTOR SLEEVE

In stowing the firing lanyard into the extractor sleeve, you must first remember that you do not remove the spreading gun safety pin at any time during this procedure.

Now you open the extractor sleeve fasteners on each side of the spreading gun safety pin; release the fastener holding the stowage sleeve to the extractor sleeve; and remove the stowage sleeve from the extractor sleeve as shown in figure 6-16. Inspect the firing lanyard for proper stowage as shown in figure 6-17.

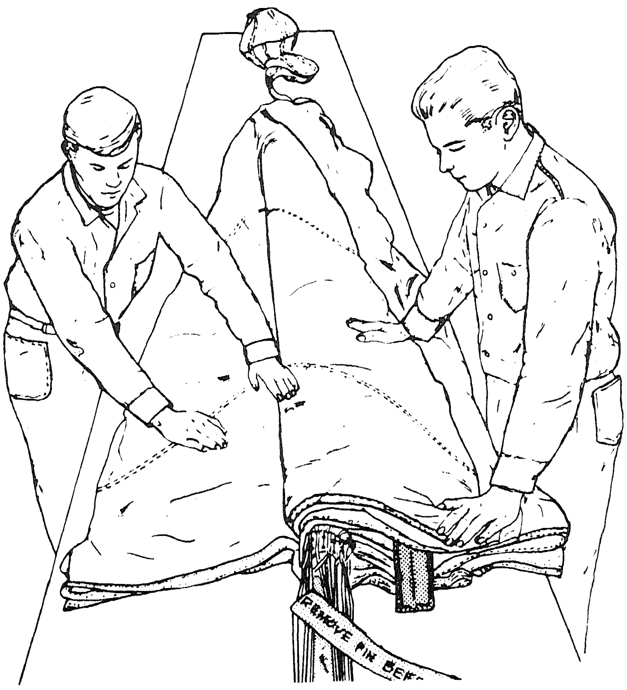


Figure 6-15.—Straightening canopy gores.

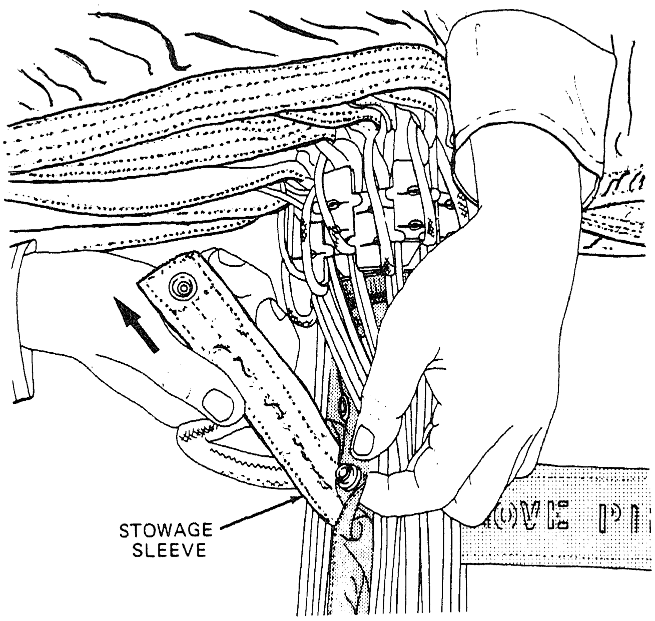


Figure 6-16.—Removing stowage sleeve.

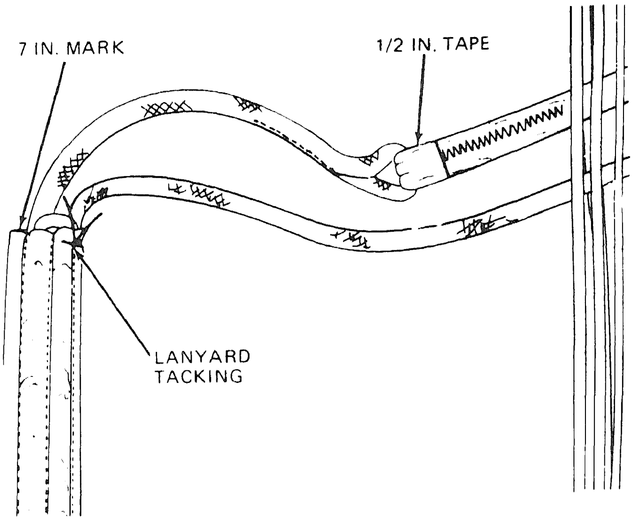


Figure 6-17.—Inspecting firing lanyard.

In this inspection you may find that the firing lanyard has been pulled out of the stowage sleeve or it may have been improperly stowed. To restow the firing lanyard, cut a piece of Type I nylon cord 30 inches long. This will aid you in stowing the lanyard.

2. Install all new suspension line retaining bands (using a lark's head knot) on the eight inboard retaining band loops located on the helper's side of the packing table and on the eight inboard retaining loops located on the packer's side of the table shown in figure 6-24. Never use rubber bands that have been used before. Always use Type I or II bands and ensure that they conform to military specifications (MIL-R-1832).

You will find that different parachutes use different lengths of arming cables. There are also three different time-delay cartridges that can be used at this time. Before you attempt to install the arming cable or the cartridge, check the NAVAIR 13-1-6.2 to ensure you are using the right ones.

Inspect, arm, and assemble the automatic actuator in accordance with Chapter 4. Record the actuator time delay, lot number, part number, type of cartridge, and the expiration date on the Parachute Configuration, Inspection, and History Card.

Now you are ready to install the actuator into the actuator pocket, close the slide fastener, and secure the protector flap.

Insert the power cable through the buttonhole in the top end of the container. Route the end of the arming cable housing through the housing port located in the right side of the actuator pocket and through the buttonhole located on the right side of the container (see figure 6-25).

Your final step is closing the hook and pile tape fastener flaps of the release pocket.

ATTACHMENT OF CONTAINER ASSEMBLY TO RISER ASSEMBLY

To attach the container assembly to the riser assembly, proceed as follows:

Remove the tension strap from the canopy peak, and remove the tension hooks from the connector links and the packing table. Rotate the risers onto the container, and secure the riser retainer fittings to the riser retainer supports

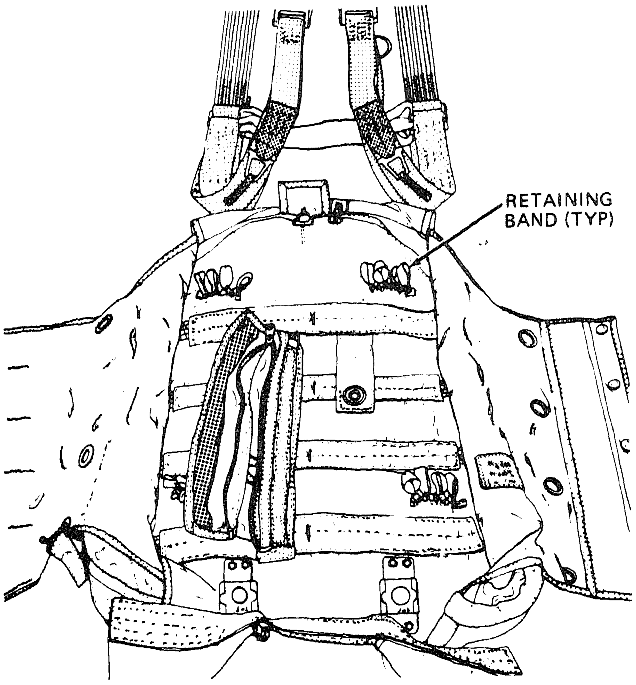


Figure 6-24.—Installing retaining bands.

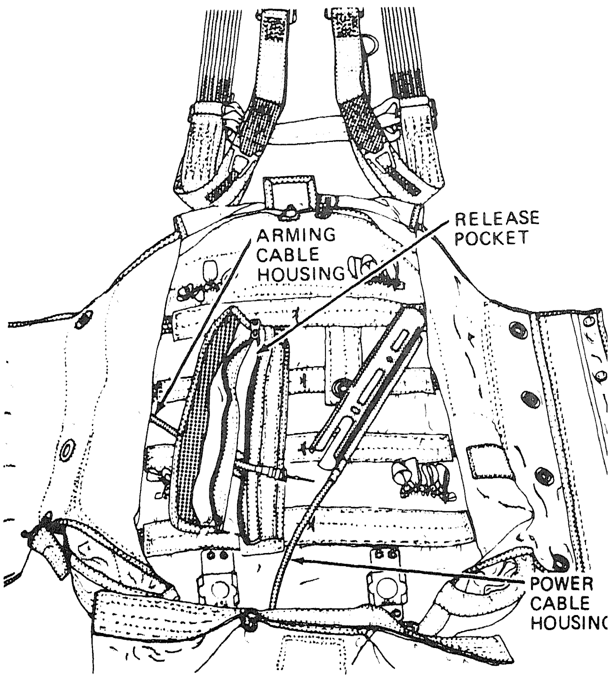


Figure 6-25.—Inserting power cable.

(figure 6-26). Now position the lift web protector flaps over the riser and install the breakcords. These two breakcords, approximately 2 inches apart, are constructed with one turn of waxed size FF nylon thread doubled. Pass the thread through the protector flap, under a support, up through the protector flap, and tie them snugly with a surgeon's knot followed by a square knot as shown in figure 6-27. Repeat this procedure for the other riser.

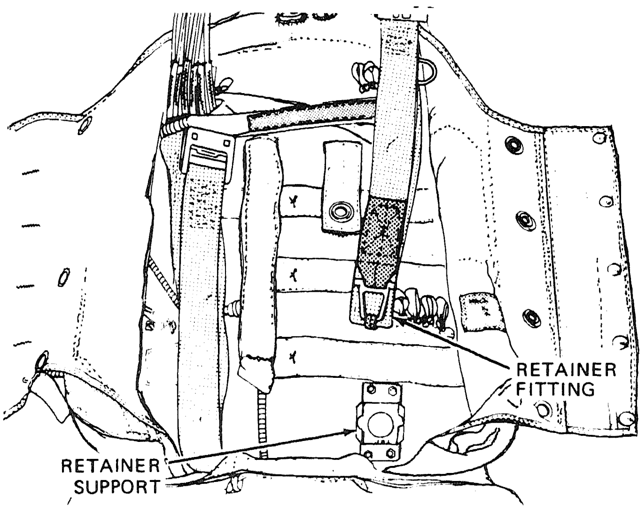


Figure 6-26.—Rotate risers.

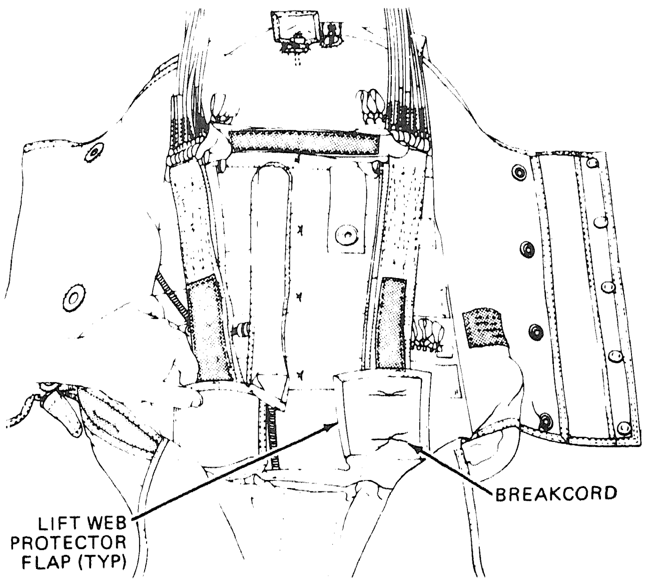


Figure 6-27.—Installing break cords.

INSTALLATION OF CONNECTOR LINK TIES

The connector link ties are a very important part of the rigging of the NES-12 and other parachutes that use the ballistic spreading gun. Not only do they prevent the risers from moving around inside of the container; they also prevent the premature deployment of the risers (riser blowout) which could cause line entanglement or premature firing of the spreader gun and provide an anchor point for the firing of the spreader gun.

To install connector link ties, proceed as follows:

First, cut two 12-inch lengths of 100-pound nylon cord and sear the ends. (Do not use waxed cord). Then, form a 1-inch loop in one end of each of the cords and secure with a bowline knot. Tie an overhand backup knot in the end of cord. (See figure 6-28.) Now position the connector links

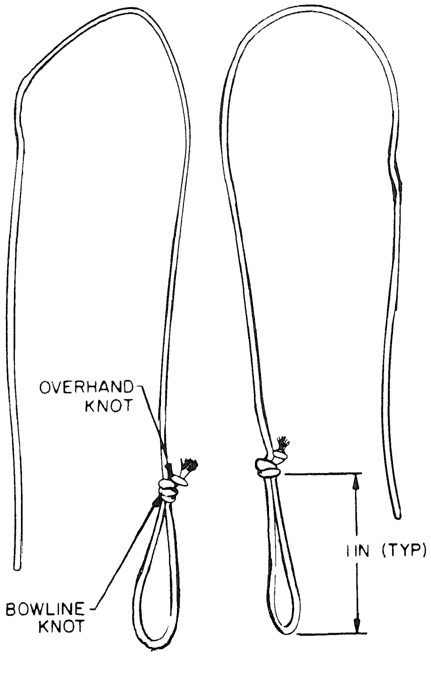


Figure 6-28.—Connector link ties.

side by side so that the top connector links are to the right of the bottom connector links, then form a noose around the connector links located on the helper's side with one of the 100-pound tie cords, as illustrated in figure 6-29.

Tighten the noose and tie the free end of the tie cord to the bottom inboard cloth retaining band loop with three to four half-hitches. Trim excess cord off.

Using the other tie cord in the same manner, secure the connector links on the packer's side.

INSTALLATION OF RELEASE ASSEMBLY LANYARD AND RIPCORD ASSEMBLY

Your first step in installing the lanyard release and ripcord assemblies is to mark the clamp release lanyard 36 inches from the locking pin end. Next, fold the top end flap onto the container so that the base plate faces up.

WARNING: Ensure that the base plate clamp is positioned over the hex nut prior to installing the locking pin (see figure 6-30).

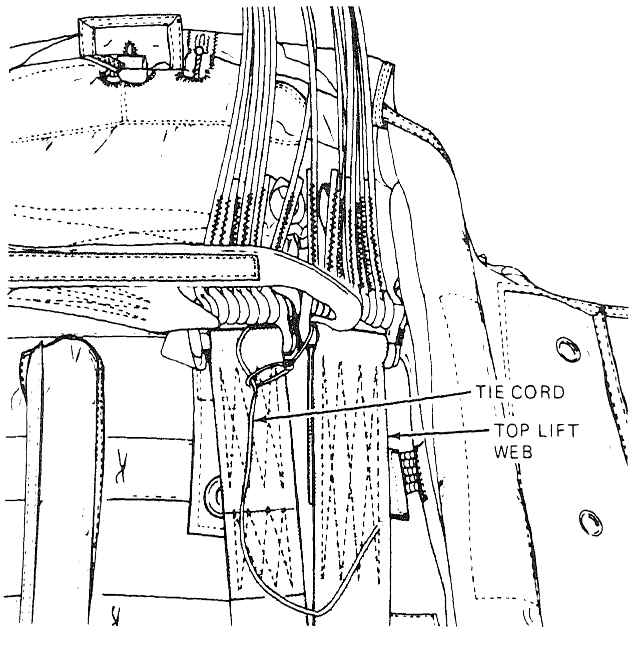


Figure 6-29.—Tying connector links.

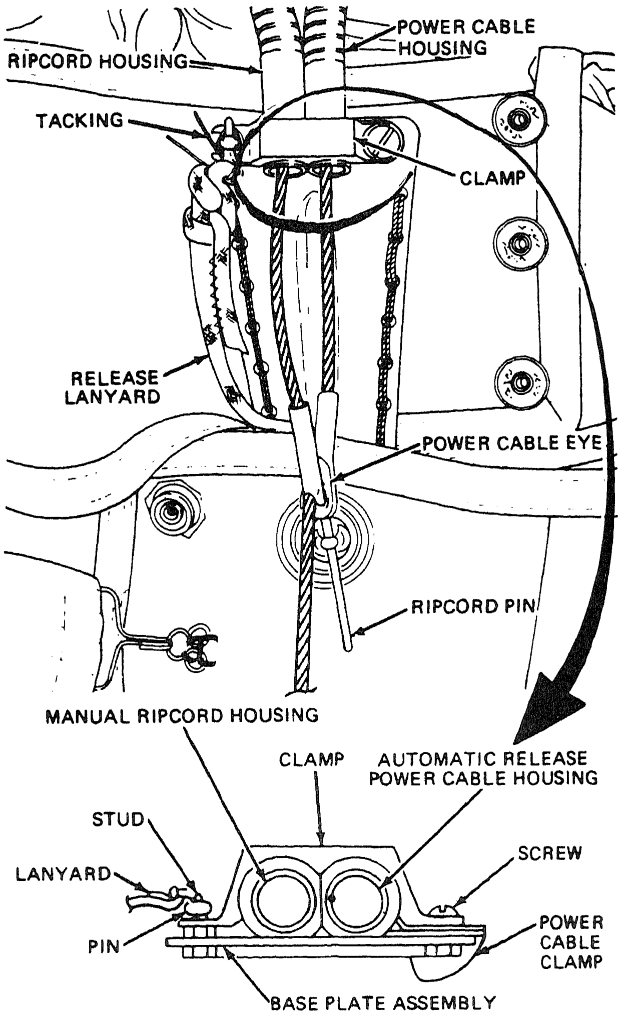


Figure 6-30.—Release lanyard assembly.

Now, position the clamp over the end fitting of the power cable housing. Insert the base plate screw through the clamp holes and into the right-hand base plate hole so that the clamp flange fits over the end of the base plate shown in above figure.

Position the large slotted end of the base plate clamp under the screwhead on the base plate. Position the manual ripcord housing and power cable housing under the clamp with two flat sides together and the other two flat sides positioned against the base plate. Place the clamp in the clamping grooves of the two housings. Position the small slotted end of the base plate clamp over the base plate stud. Insert the release lanyard locking pin into the stud hole. Secure the clamp in place. The locking pin should be finger tight; if necessary, slightly loosen the screw. Ensure the two housings are correctly positioned and securely retained. Safety-tie the locking pin to the stud with one turn of waxed size FF nylon thread (V-T-295), single. Pass the thread through the lanyard knot and tie the ends with a surgeon's knot followed by a square knot.

The next step is to insert the top ripcord pin through the beveled side of the eye in the power cable. Route the lanyard over the helper's side of the top end flap "V". Tack the lanyard to the top end flap at the "V" with 1/8 inch slack between the locking pin and the tacking, passing the tacking around the lanyard. Use one turn of waxed size A nylon thread, single. Tie its ends with a surgeon's knot followed by a square knot (figure 6-31).

Route the lanyard along the inside of the top end flap to the helper's side of the automatic actuator power cable buttonhole. Tack the lanyard to the upper edge of the container with one turn of single, waxed, size A nylon thread (see figure 6-32), allowing 1/8 inch slack between the tackings. The tacking must pass around the lanyard and not through it. Tie the ends with a surgeon's knot followed by a square knot.

Reeve the lanyard through the lanyard guide grommet. (See figure 6-33.) Place the 36-inch mark on the lanyard over the bar on the inboard connector link located on the helper's side. Secure the lanyard to the connector link bar with a bowline knot. Ensure the lanyard is positioned between the webbing and the connector link end. Tie an overhand backup knot in the end of the lanyard. Have the CDI inspect your work at this point.

ATTACHMENT OF FIRING LANYARD TO SUSPENSION LINE CONNECTOR LINK

Before attaching the firing lanyard, ensure that the safety pin is installed in the spreading gun. Then starting at the gun, route the firing lanyard between suspension lines 7 and 8. Slide the canopy towards the container and form an S-fold in the

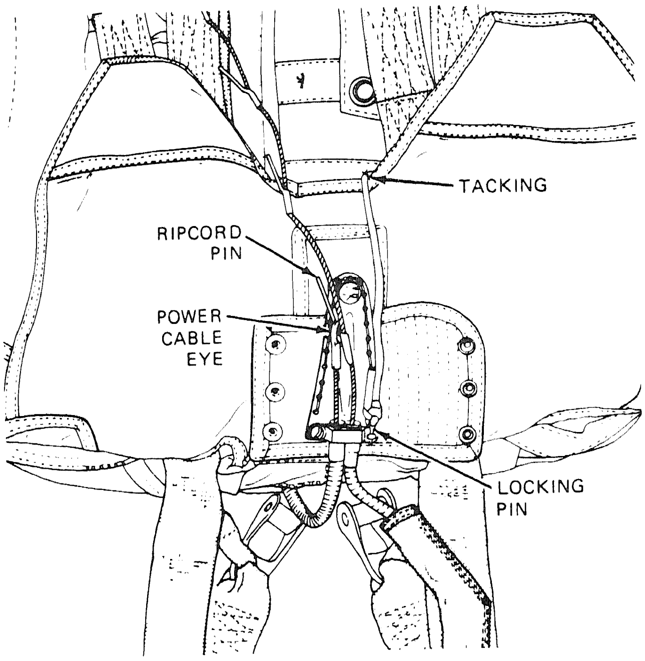


Figure 6-31.—Tacking locking pin.

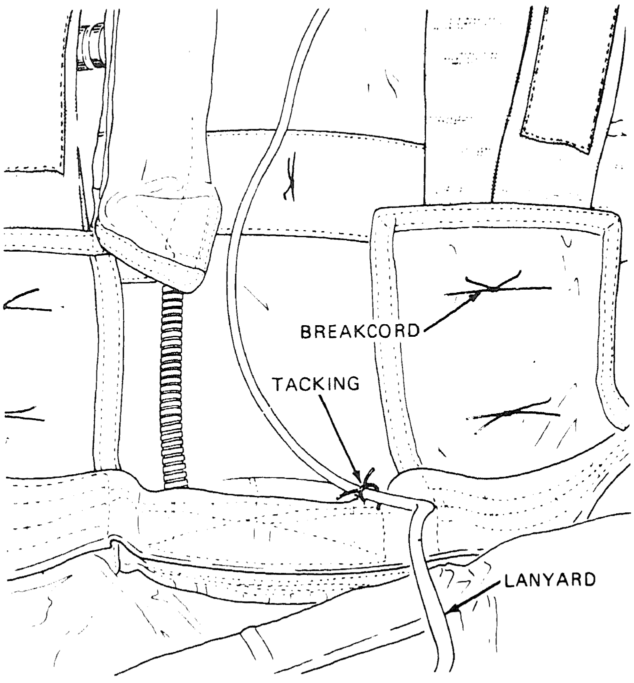
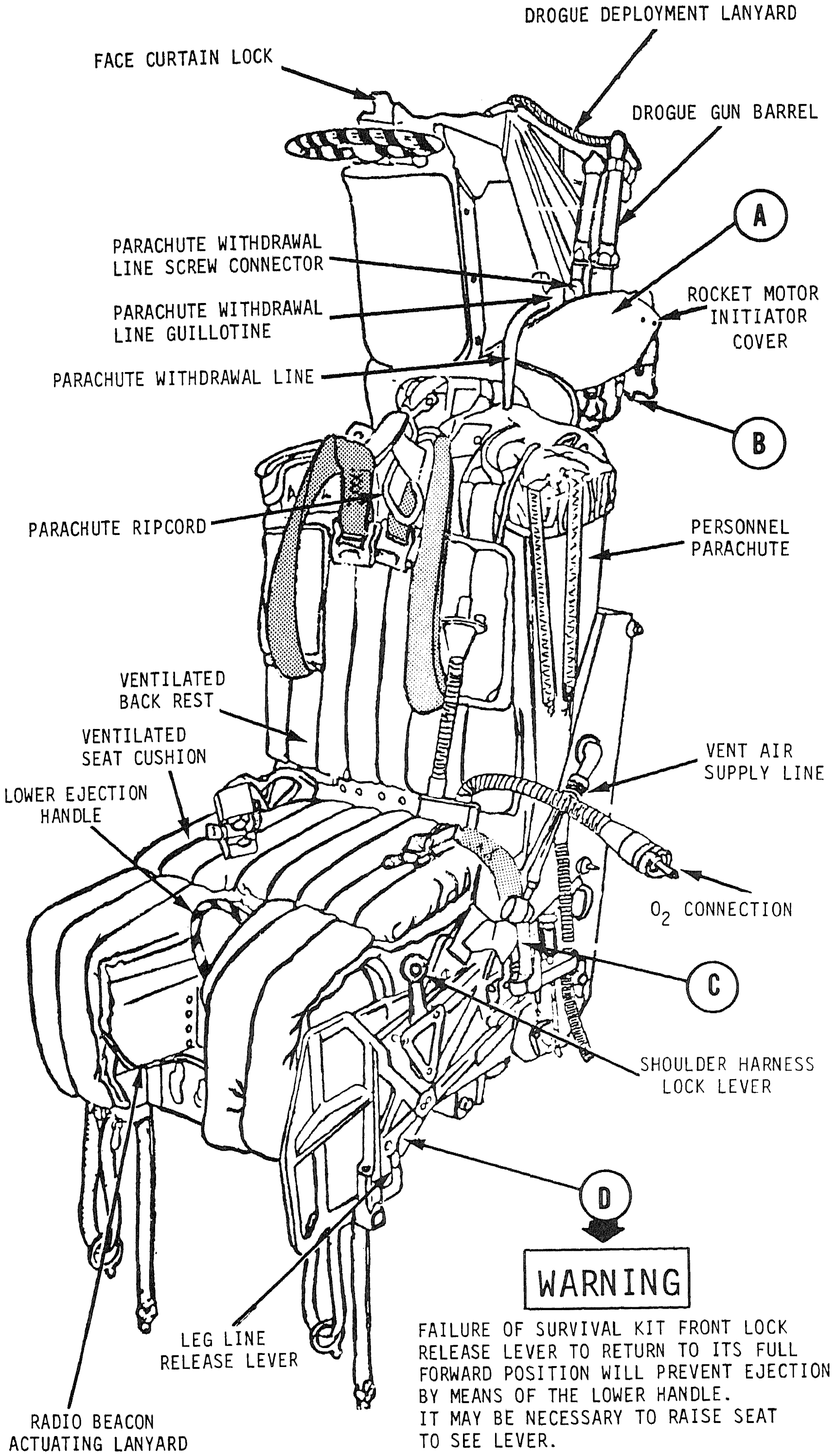


Figure 6-32.—Tacking release lanyard.


DROGUE DEPLOYMENT LANYARD
FACE CURTAIN LOCK
DROGUE GUN BARREL
A
PARACHUTE WITHDRAWAL LINE SCREW CONNECTOR
PARACHUTE WITHDRAWAL LINE GUILLOTINE
ROCKET MOTOR INITIATOR COVER
PARACHUTE WITHDRAWAL LINE
B
PARACHUTE RIPCORD
PERSONNEL PARACHUTE
VENTILATED BACK REST
VENTILATED SEAT CUSHION
LOWER EJECTION HANDLE
VENT AIR SUPPLY LINE
O_2 CONNECTION
C
SHOULDER HARNESS LOCK LEVER
D
LEG LINE RELEASE LEVER
RADIO BEACON ACTUATING LANYARD

WARNING

FAILURE OF SURVIVAL KIT FRONT LOCK RELEASE LEVER TO RETURN TO ITS FULL FORWARD POSITION WILL PREVENT EJECTION BY MEANS OF THE LOWER HANDLE. IT MAY BE NECESSARY TO RAISE SEAT TO SEE LEVER.

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Figure 7-1.—NES-14A personnel parachute installed in MK-GRU-7 ejection seat.

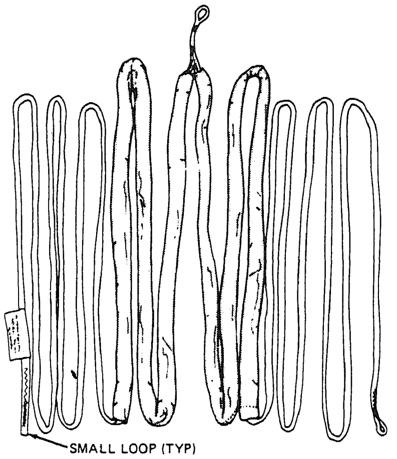

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Figure 7-2.—Shortened anti-squid lines.

is interrupted, the parachute assembly must be completely repacked.

As in the other rigging and packing procedures, you, as the packer, are positioned on the left side of the packing table and your helper on the right when facing the canopy from the harness/riser end of the packing table.

To prepare the parachute assembly for rigging and packing, the following preliminary procedures should be followed:

Step 1. You and your helper shall remove the stowage tray from the container before removing the suspension lines from the stowage tray.

Step 2. Now lay out the packing tools on the packing table and inspect them for nicks, burrs, or sharp edges which may damage the parachute

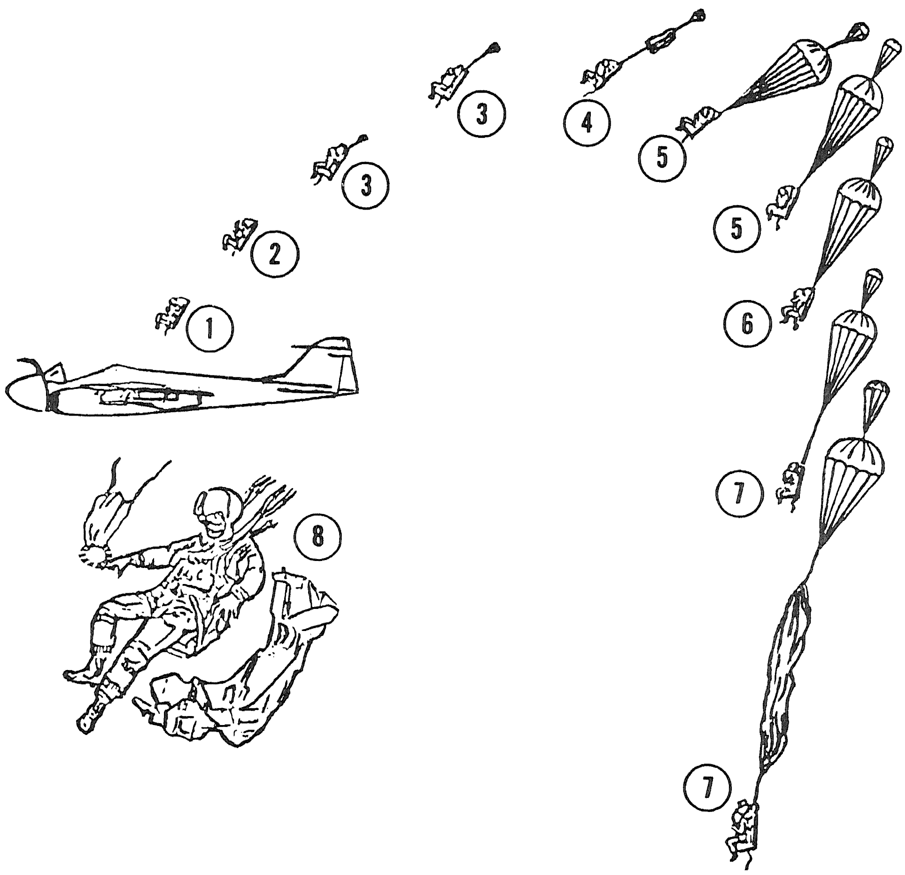

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Figure 7-3.—Ejection sequence.

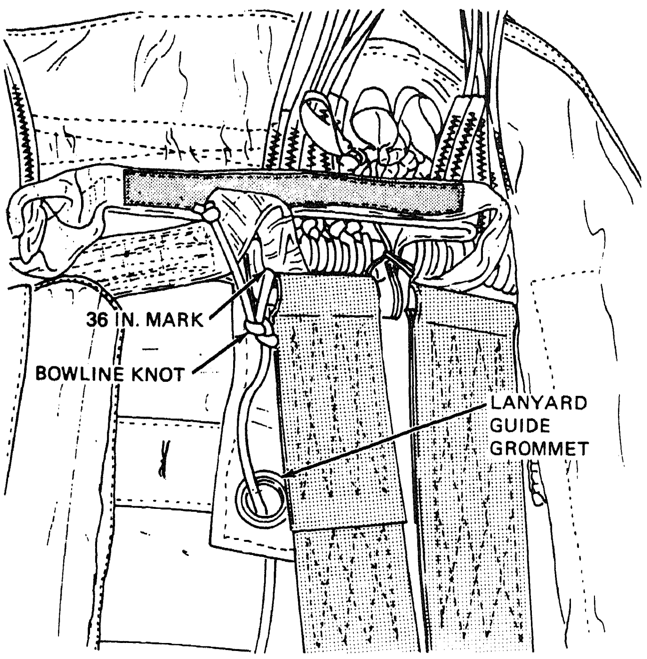


Figure 6-33.—Reeving release lanyard.

suspension lines large enough to allow the loop in the end of the firing lanyard to align with its connector links. Be careful to check to see that no suspension lines are dropped from the connector link bar.

As you have read this chapter on the NES-12, you may have noticed that each time you have removed the yoke and plate assembly from the connector link, the book has told you to tighten and torque the screw when reassembling the connector link. This was done to prevent the torquing from being missed if you were only performing one of the many operations that require you to remove and replace the yoke and plate. If you have performed all the operations described, then at this time you do the final torquing before the suspension lines are placed into the container. Therefore, it is very important that you complete this step in the following manner and have it inspected.

Remove the yoke and plate assembly on the outboard top connector link located on the helper's side. Insert the connector link bar through the loop in the firing lanyard and reattach the yoke and plate assembly. Tighten the screw to a torque value of 20 to 25 pound-inches. Apply a tamper dot to the connector link screwhead using lacquer (TT-L-32, color 11136, insignia red or equivalent).

At this point, you have completed the rigging and you are ready for the packing procedure.

When actually performing any of these procedures, you will refer to the NAVAIR 13-1-6.2. Also, you will find that some of your rating exam questions will be taken from this NAVAIR manual.

CHAPTER 7

NES-14A PERSONNEL PARACHUTE ASSEMBLY

DESCRIPTION

The NES-14A personnel parachute assembly is designed for use with an integrated torso harness suit and is part of the MK-GRU-7 ejection seat escape system shown in figure 7-1. Some parachutes fall in the aircraft inventory category and other parachutes are organizational property. The NES-14A is part of the aircraft inventory.

CONFIGURATION

The NES-14A personnel parachute includes the standard multicolored 28-foot flat nylon canopy and pilot chute. The big difference in this canopy is that it uses shortened anti-squid lines (see figure 7-2). These lines are shorter than the distance from the connector links to the vent. They prevent the main canopy from squidding by bearing the load of the drogue parachute until the main canopy is fully opened. The ejection sequence is shown in figure 7-3.

The remaining parts that make up the NES-14A are the riser assembly, stowage tray, pack pad, hard-shell container, and withdrawal line.

RIGGING AND PACKING

When you check into a squadron or AIMD that has the NES-14A personnel parachute, you will probably at one time or another be assigned to rig and pack the NES-14A. The NES-14A is quite different from the other two parachutes we have covered in this book. Although the canopy, four-line release system and inspections are the same, you will find the packing and rigging quite different. The container shown in figures 7-4 and 7-5 is a hard shell container which is quite different from the other two we have covered. If you look at figure 7-6, you will find that this parachute has a stowage tray for suspension lines. This stowage tray is designed to enable you, the packer, to stow the suspension lines outside of the container, making the stowing much easier.

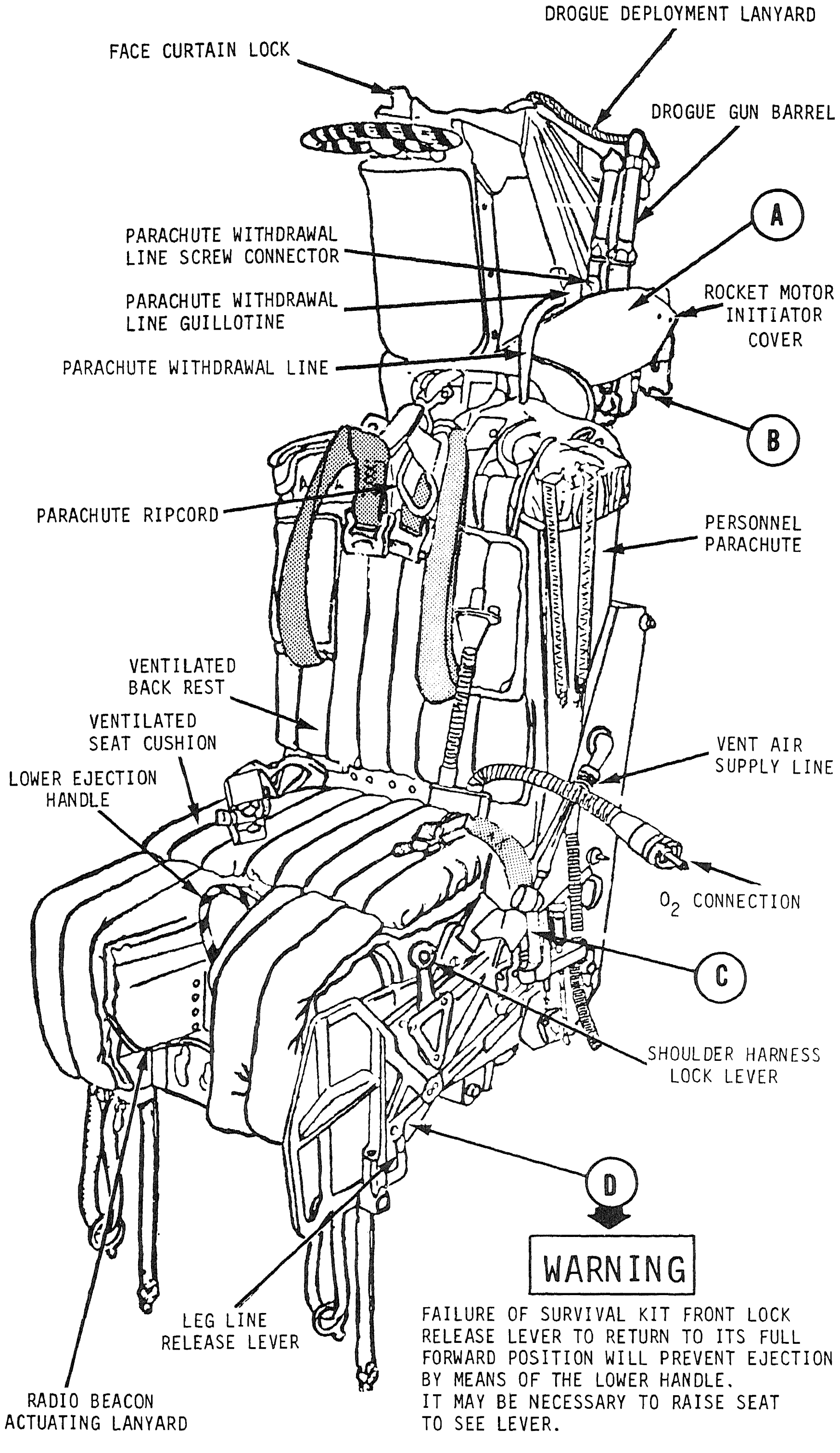
As you read through this chapter, you may notice that we have left out inspecting the canopy for defects. This inspection must be performed on all parachutes; refer back to Chapter 3.

All rigging and packing instructions are provided with the assumption that they will be carried out under ideal conditions in a parachute loft. When a parachute assembly must be packed under unfavorable conditions, provision must be made to protect it from possible damage and excessive humidity.

NOTE: In this chapter, collateral duty inspection (CDI) points have been included in rigging and packing procedures. When a step is underlined, CDI is required. All work shall stop until a Collateral Duty Inspector has performed the requirements listed at the end of the applicable paragraph. The fact that the instructions given here are in the same format as NAVAIR 13-1-6.2 does not mean that they replace them. Use the proper source document when actually working on a parachute.

PROCEDURES

When you are packing an NES-14A, like all other parachutes, the packing of the parachute assembly can NOT be interrupted once the packing operation has been started. If, due to unforeseen circumstances, the packing operation

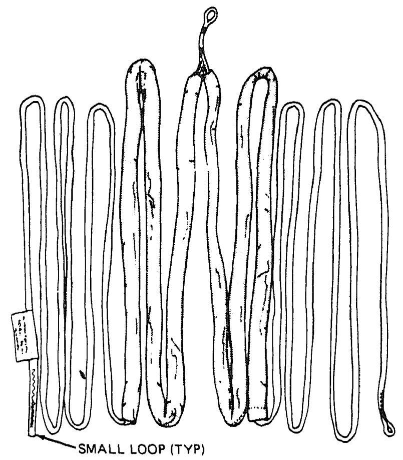

DROGUE DEPLOYMENT LANYARD
FACE CURTAIN LOCK
DROGUE GUN BARREL
A
PARACHUTE WITHDRAWAL LINE SCREW CONNECTOR
PARACHUTE WITHDRAWAL LINE GUILLOTINE
ROCKET MOTOR INITIATOR COVER
PARACHUTE WITHDRAWAL LINE
B
PARACHUTE RIPCORD
PERSONNEL PARACHUTE
VENTILATED BACK REST
VENTILATED SEAT CUSHION
LOWER EJECTION HANDLE
VENT AIR SUPPLY LINE
O2 CONNECTION
C
SHOULDER HARNESS LOCK LEVER
D
LEG LINE RELEASE LEVER
RADIO BEACON ACTUATING LANYARD

WARNING

FAILURE OF SURVIVAL KIT FRONT LOCK RELEASE LEVER TO RETURN TO ITS FULL FORWARD POSITION WILL PREVENT EJECTION BY MEANS OF THE LOWER HANDLE. IT MAY BE NECESSARY TO RAISE SEAT TO SEE LEVER.

239.479

Figure 7-1.—NES-14A personnel parachute installed in MK-GRU-7 ejection seat.



239.480

Figure 7-2.—Shortened anti-squid lines.

is interrupted, the parachute assembly must be completely repacked.

As in the other rigging and packing procedures, you, as the packer, are positioned on the left side of the packing table and your helper on the right when facing the canopy from the harness/riser end of the packing table.

To prepare the parachute assembly for rigging and packing, the following preliminary procedures should be followed:

Step 1. You and your helper shall remove the stowage tray from the container before removing the suspension lines from the stowage tray.

Step 2. Now lay out the packing tools on the packing table and inspect them for nicks, burrs, or sharp edges which may damage the parachute

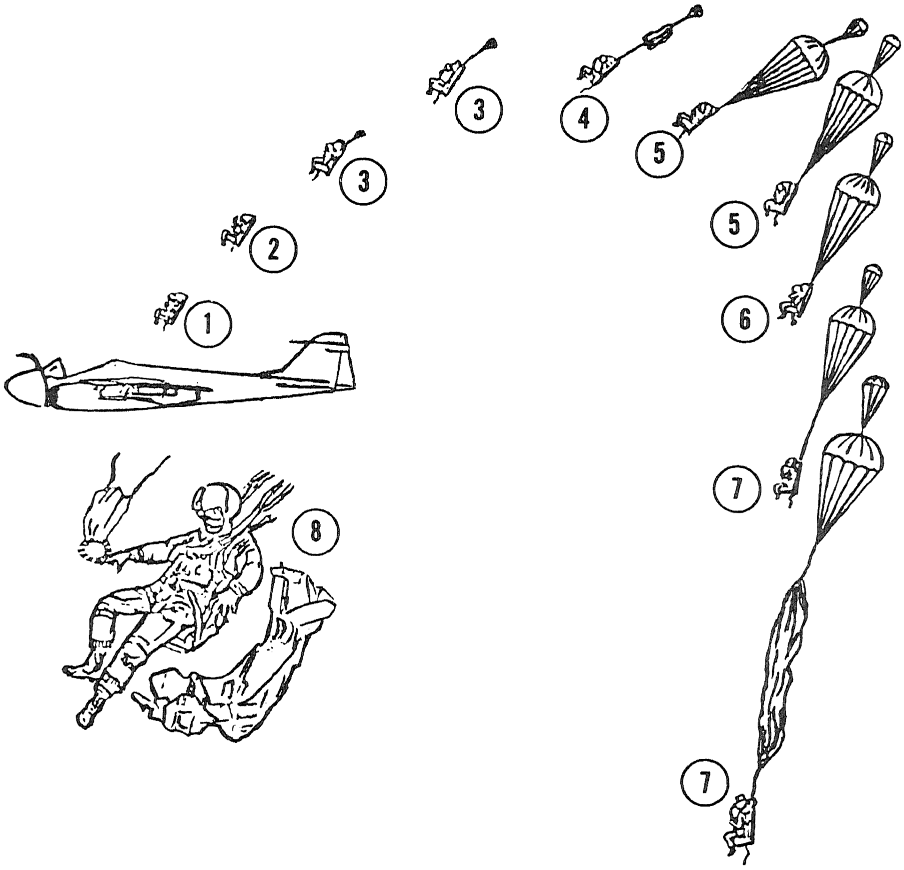


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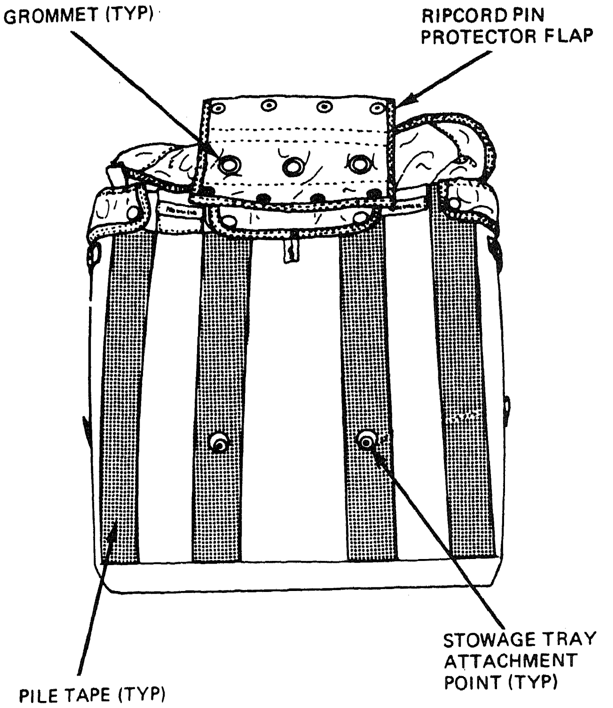
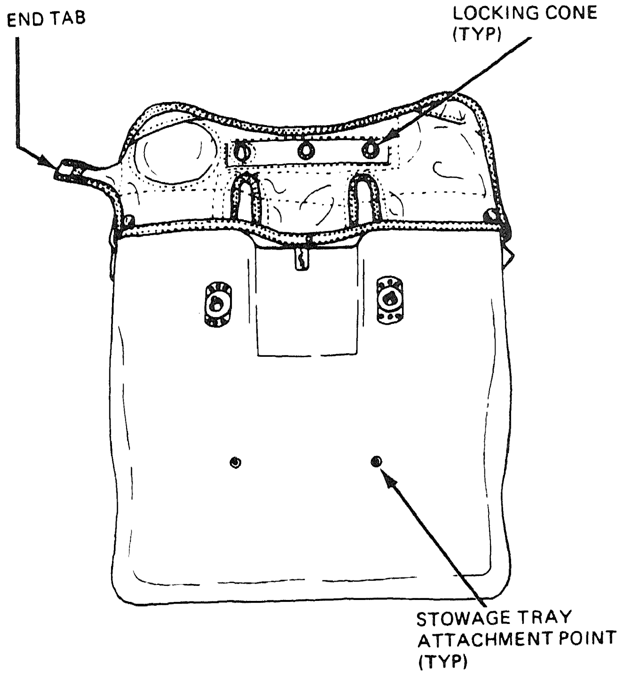
Figure 7-3.—Ejection sequence.


GROMMET (TYP)
RIPCORD PIN PROTECTOR FLAP
STOWAGE TRAY ATTACHMENT POINT (TYP)
PILE TAPE (TYP)

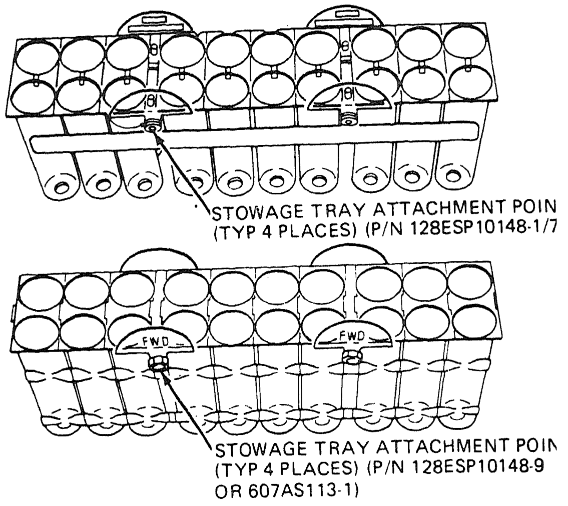
239.482

Figure 7-4.—Container assembly (front).



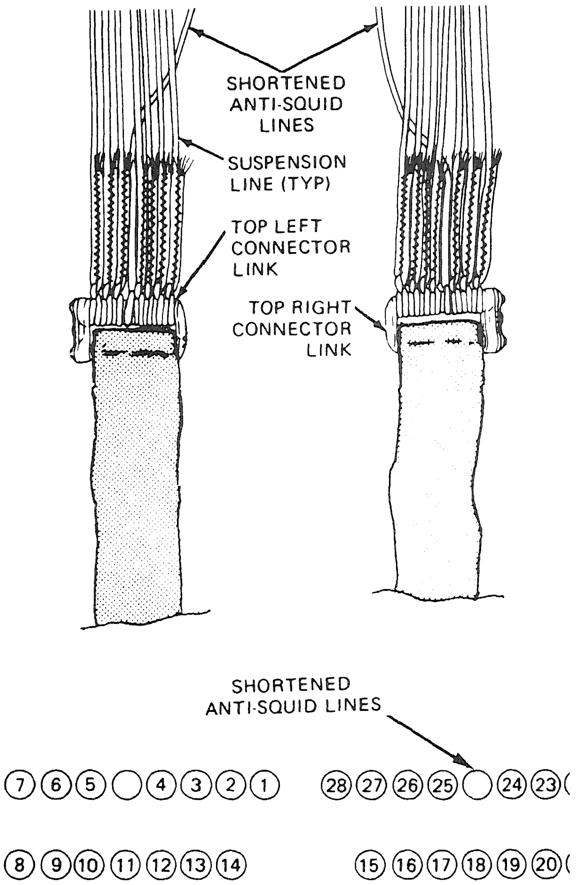
239.483

Figure 7-5.—Container assembly (back).


STOWAGE TRAY ATTACHMENT POIN
(TYP 4 PLACES) (P/N 128ESP10148-1/7
FWD
STOWAGE TRAY ATTACHMENT POIN
(TYP 4 PLACES) (P/N 128ESP10148-9
OR 607AS113-1)

239.4

Figure 7-6.—Stowage tray.



239.

Figure 7-7.—Suspension line continuity check, step

assembly. Count and record the number of packing tools.

Step 3. Lay out the canopy assembly full length on a clean packing table. Locate the canopy gore with the nameplate and place it bottommost in the center of the table. Separate the suspension lines into two equal groups, counting 14 suspension lines on each side of the nameplate gore. Ensure that the suspension lines are equally divided on each side of the nameplate gore.

Step 4. Arrange the groups of 14 suspension lines on either side of the nameplate gore as shown in figure 7-7 as viewed from the connector links.

NOTE: At this time make sure that the knurled portions of the connector link yoke and plate assemblies are facing upward and the screwheads face outboard.

Step 5. Place the connector link that holds suspension lines 15 through 21 on top of the connector link holding suspension lines 22 through 28. Place the connector link that holds suspension lines 8 through 14 on top of the connector link holding suspension lines 1 through 7. Connect these two groups of connector links to their respective tension hooks on the packing table. You must disconnect the anti-squid lines at the vent. (These are the lines that are shorter than the regular suspension lines.)

Step 6. Lay out the shortened anti-squid lines full length on the packing table. The end with the small loop shall be positioned at the connector links and the end with the large loop shall be positioned at the skirt hem. Pass a piece of nylon cord approximately 16 feet long through the inside of the canopy starting at the skirt hem and running to the peak of the canopy. Later you will use this line as a messenger cord to pull the anti-squid lines through the canopy. The 16-foot messenger cord must extend one foot beyond the skirt hem and beyond the canopy peak. After you have completed this routing, attach the larger loop end of the shortened anti-squid line to the end of the messenger cord at the skirt hem. At this point you completely inspect the parachute following the inspection requirements outlined in NAVAIR 13-1-6.2 and described in Chapter 3.

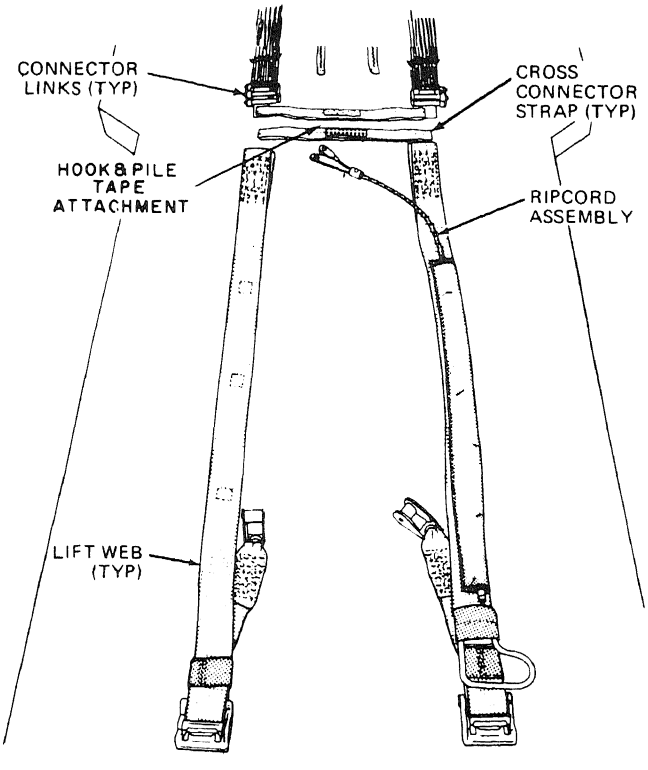
SUSPENSION LINE CONTINUITY CHECK

In order to check the suspension line continuity follow the procedures described in chapter 3 with the following exception: If attached, the anti-squid lines will be connected at the top connector links between lines 10 and 11 and 18 and 19, as applicable. They shall run under the top suspension lines to the Type III messenger cord without twisting around any suspension line.

ATTACHMENT OF RISER ASSEMBLY, CROSS-CONNECTOR STRAPS, AND SHORTENED ANTI-SQUID LINES TO CONNECTOR LINKS

On original issue parachutes, to attach the riser assembly, cross connector straps, and shortened anti-squid lines to connector links, proceed as follows:

Step 1. Lay out riser assembly and cross connector straps on the packing table as shown in figure 7-8. Corresponding lift webs shall be



239.486

Figure 7-8.—Attachment of riser assembly, step 1.

placed on top of each other and positioned at connector links. The ripcord assembly must face upward.

NOTE: Ensure that knurled portions of the connector link yoke and plate assemblies face upward and screwheads face outboard.

Step 2. You must remove the connector links from the tension hooks and remove the tension hooks from the packing table.

Step 3. Remove the connector link yoke and plate assemblies from the connector link(s). Slide the suspension lines from the link onto a temporary locking pin or rod. Insert the connector link into the looped end of the cross-connector strap with the applicable lift web. (See figure 7-9.)

At this time you will place the suspension lines onto the connector link in their proper order as shown in figure 7-10. Note that the shortened anti-squid lines are between lines 18 and 19 and between 10 and 11. The anti-squid lines must pass under the suspension lines to the connector links. Ensure that the four-line release system is properly rigged. (See figure 7-11.) When attaching the yoke and plate assemblies of the connector links, ensure that you tighten the screws to a torque of 20 to 25 inch-pounds. (CDI inspection required.) Apply to tamper dot to each screw using insignia red lacquer paint (TT-L-32) or equivalent.

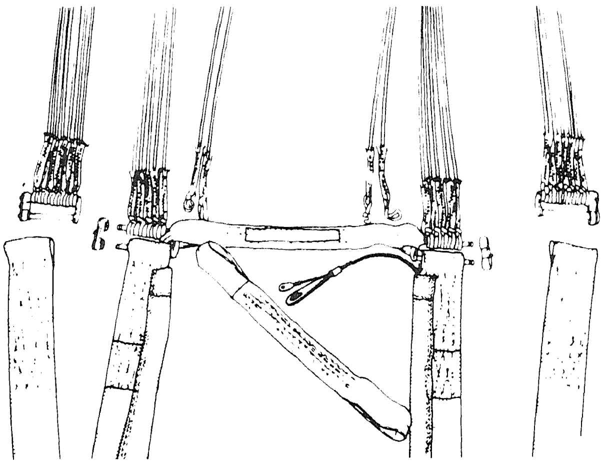


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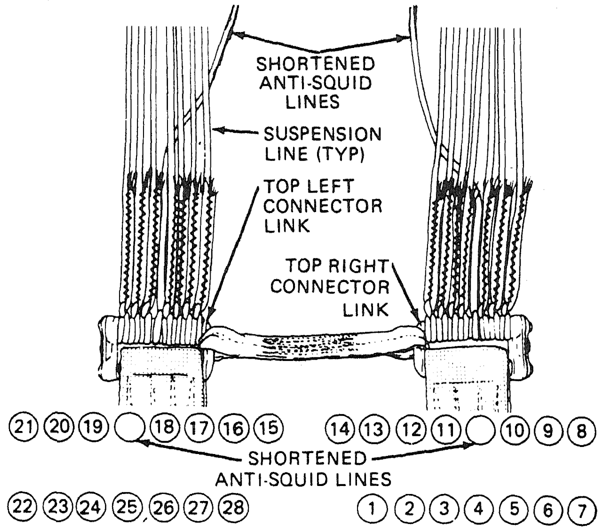
Figure 7-9.—Attachment of cross connector, step 3.



239.488

Figure 7-10.—Proper suspension line order.

Reattach connector links to tension hooks. Tighten the anti-squid lines at the canopy peak using Type III nylon cord drawn through the canopy.

TACKING KICK PLATE (ORIGINAL ISSUE ONLY)

To tack the kick plate, proceed as follows:

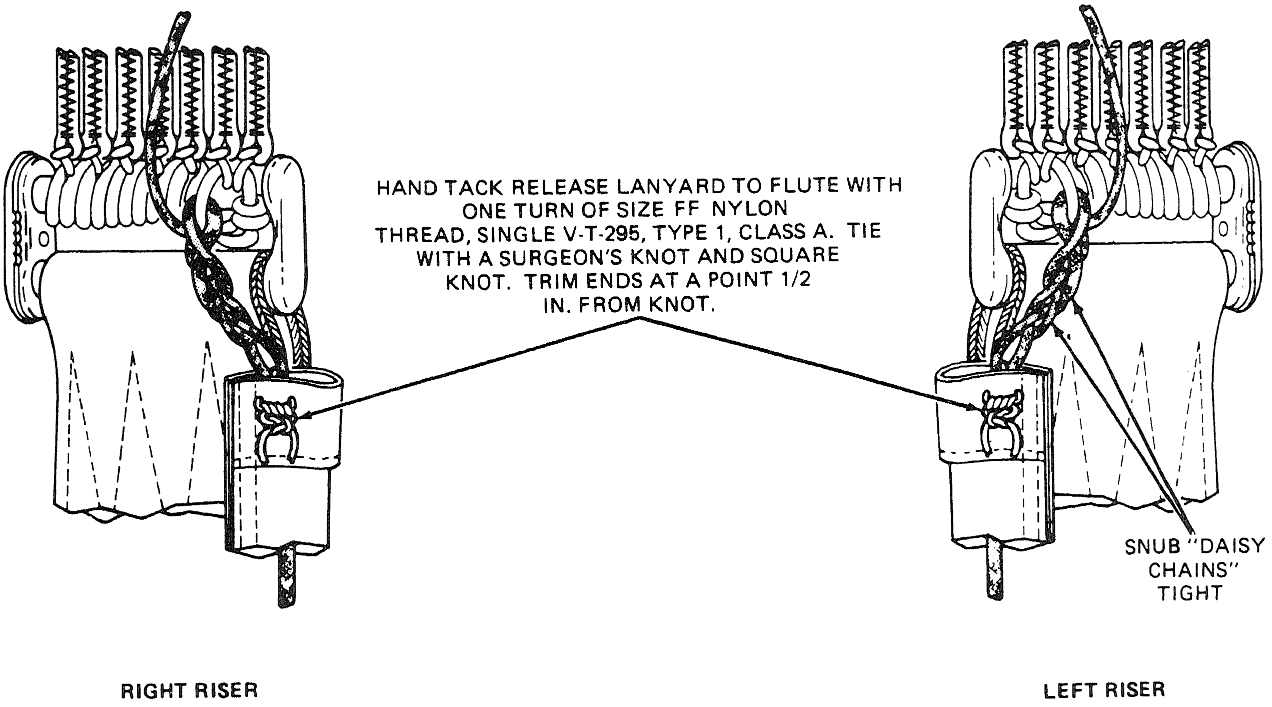
Step 1. Mark the kick plate one inch from where it is attached to the flap. When making the tackings, ensure that they are aligned horizontally as shown in figure 7-12.

Step 2. Use two turns of waxed, nylon 6-cord single thread; tack the kick plate to the flap in three places, tie the ends with a surgeon's knot followed by a square knot. (CDI inspect.)

WHIPPING AND FOLDING

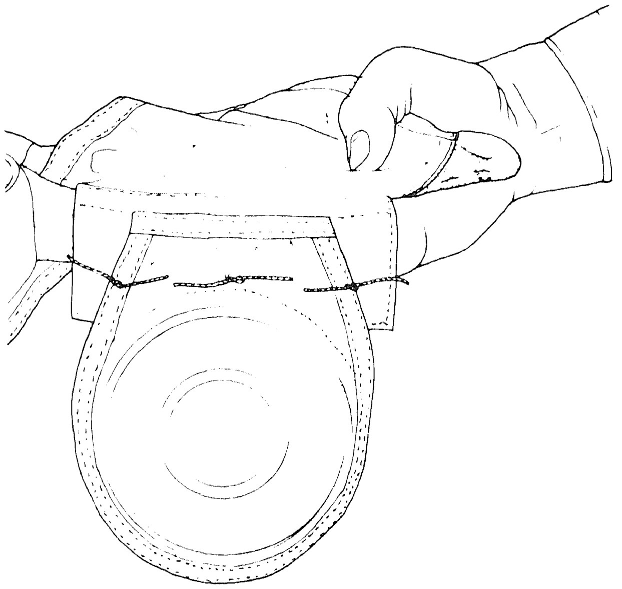
To whip and fold the canopy, proceed as follows:

Step 1. Ensure the tension strap is tightened at the canopy peak. Pull the vent collar below the


HAND TACK RELEASE LANYARD TO FLUTE WITH ONE TURN OF SIZE FF NYLON THREAD, SINGLE V-T-295, TYPE 1, CLASS A. TIE WITH A SURGEON'S KNOT AND SQUARE KNOT. TRIM ENDS AT A POINT 1/2 IN. FROM KNOT.
SNUB "DAISY CHAINS" TIGHT
RIGHT RISER
LEFT RISER

239.489

Figure 7-11.—Four line release installed.



239.490

Figure 7-12.—Tacking kick plates, step 2.

vent hem. Straighten the vent hem as necessary and return the collar to the original position.

Step 2. You and your helper lift the suspension line on each side of the nameplate gore up and out. The skirt hem between the lines shall be taut so that the canopy peak can be seen on the inside. While holding suspension lines up, each person whips the gore hanging from the line outwards to prepare the canopy for folding. (See figure 7-13.)

Step 3. Draw the next suspension line upwards in the same manner to the line in your hand using a rapid, circular motion as shown in figure 7-14.

Step 4. Continue the whipping operation for all gores. Move the gores rapidly back and forth across the table. Ensure that the

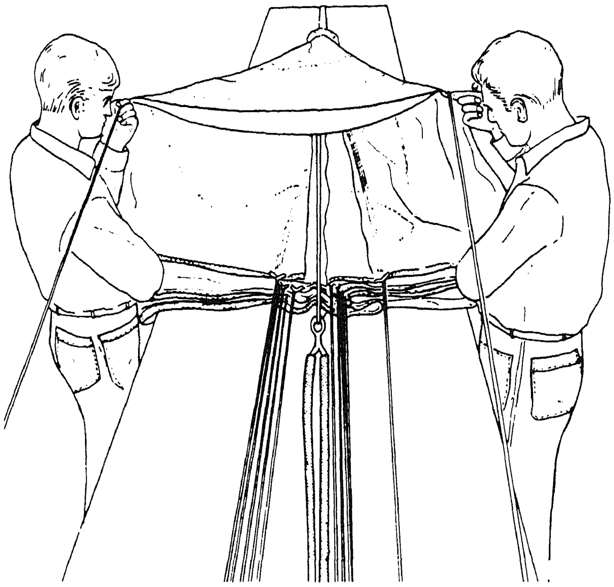


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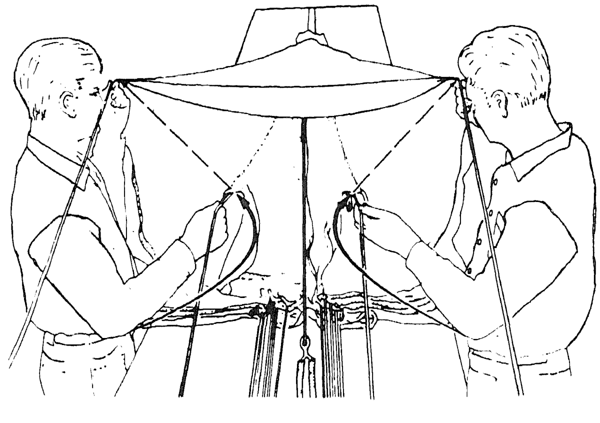
Figure 7-13.—Whipping and folding, step 2.



239.492

Figure 7-14.—Whipping and folding, step 3.

radial seams are not overlapped by any gore material. (See figure 7-15.)

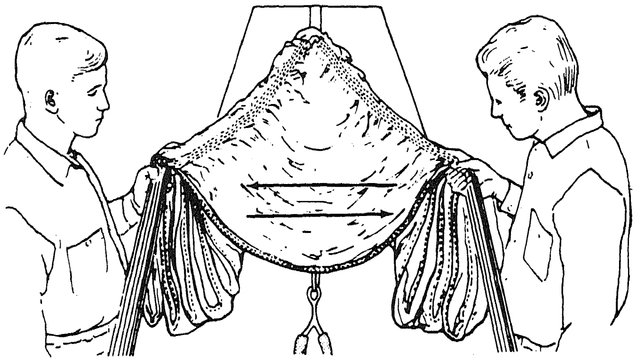


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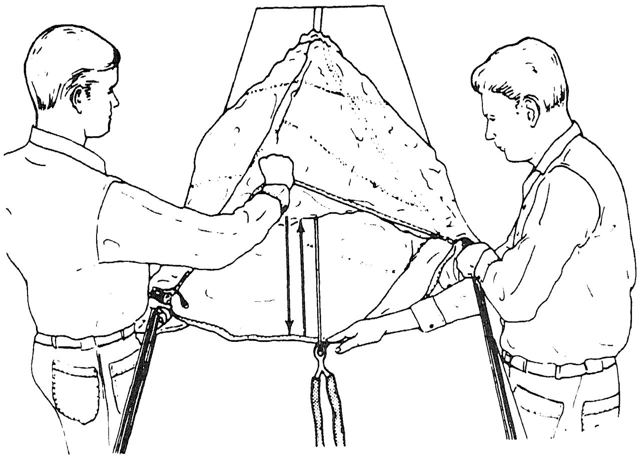
Figure 7-15.—Whipping and folding, step 4.



239.495

Figure 7-16.—Whipping and folding, step 6.

Step 5. The two groups of suspension lines shall be stretched to the edges of the packing table with folded gores hanging over the sides. You and your helper grasp all folds at the outer edges of the skirt hem and hold the suspension line groups at the edges of the packing table. You and your helper simultaneously move the folds up and down rapidly, in a whipping motion to eliminate wrinkles.

Step 6. You, the packer, shall flap the top gore up and down at the skirt hem center as the helper holds the bottom gore at the skirt hem center. (See figure 7-16.)

Step 7. On signal, both of you draw your respective gores, at the skirt hem centers, toward the table edge while at the same time bringing the suspension line groups to the center of the packing table. (See figure 7-17.)

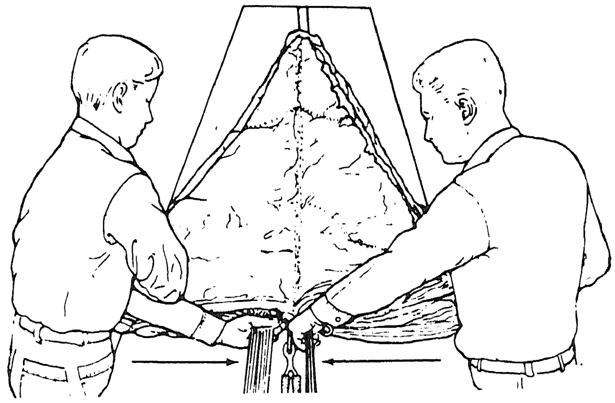
Step 8. Insert each suspension line group into its respective slot in the suspension line separator and place a shot bag across the skirt hem on the left side of the suspension line. The anti-squid lines are routed under the suspension line separator.

Step 9. Your helper shall rotate all gores, except the bottom gore, from the helper's side to your side of the packing table. (See figure 7-18.)

Step 10. Your helper then straightens and smooths the bottom gore on the helper's side of the packing table throughout its length to its peak. (See figure 7-19.)

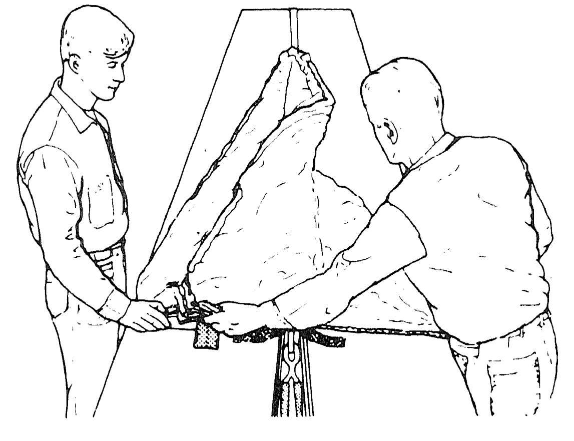
Step 11. You must return the folded gores above the shot bag to the helper's side of the packing table. Your helper then straightens and smooths the top gore and places a shot bag on the skirt hem. (See figure 7-20.)

Step 12. You must rotate all the gores together, except the bottom gore, from your



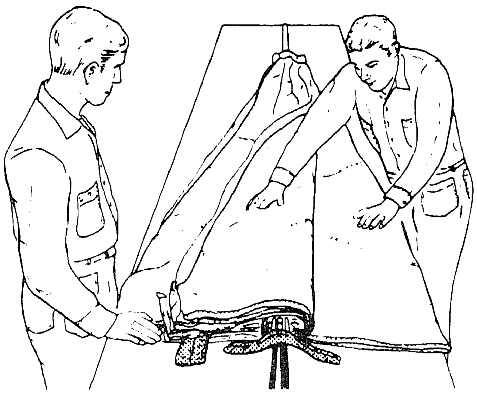
239.496

Figure 7-17.—Whipping and folding, step 7.



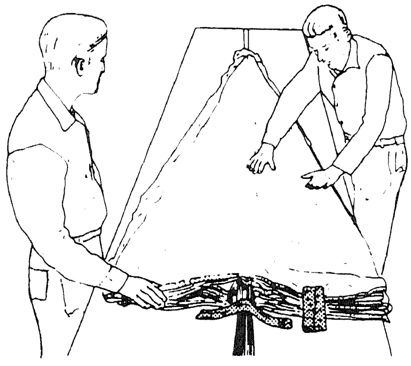
239.497

Figure 7-18.—Whipping and folding, step 9.



239.498

Figure 7-19.—Whipping and folding, step 10.



239.499

Figure 7-20.—Whipping and folding, step 11.

side to your helper's side of the packing table. (See figure 7-21.)

Step 13. You shall straighten and smooth the bottom gore on your side of the packing table throughout its length to the peak. (See figure 7-22.)

Step 14. Your helper then returns all folded gores above the shot bag to your side of the packing table. You straighten and smooth the top gore. Your helper removes the shot bag from the skirt hem. (See figure 7-23.)

Step 15. You and your helper grasp the skirt hem at the mid-sections of the gores and rotate it toward the suspension lines. (See figure 7-24.)

Step 16. Align and count each fold as it is placed back onto the packing table. You should have 14 on each side as shown in figure 7-25.

Step 17. Make the skirt hem neat by having all V-tab reinforcements aligned in the same direction on top of each other. Check again to see that each group of folds on the left and right of the suspension lines has 14 gores. (See figure 7-26.)

Step 18. Now you and your helper grasp the skirt hem and the folded gores and S-fold the canopy toward the center. Butt the S-folds together. The canopy cannot be S-folded throughout the entire length, because of its taper. The S-folds will end approximately two-thirds of

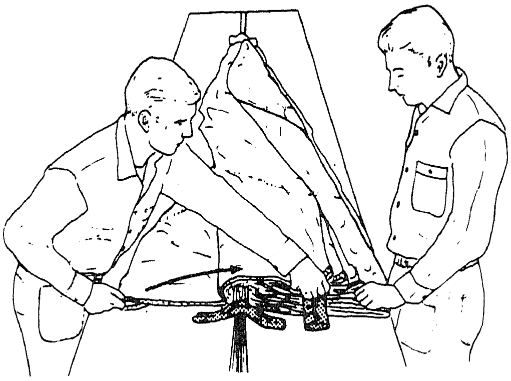


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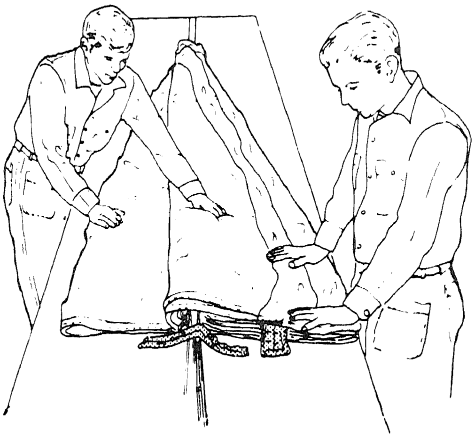
Figure 7-21.—Whipping and folding, step 12.



239.501

Figure 7-22.—Whipping and folding, step 13.

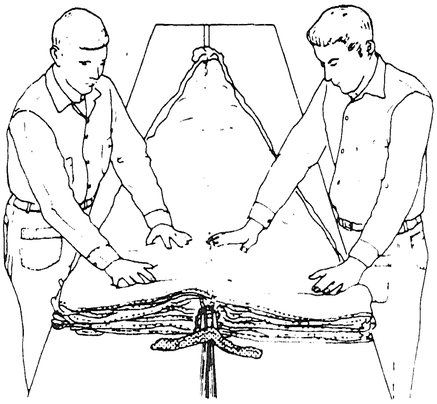


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Figure 7-23.—Whipping and folding, step 14.

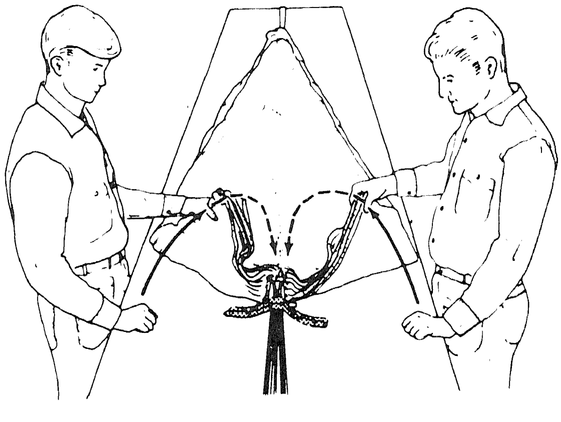

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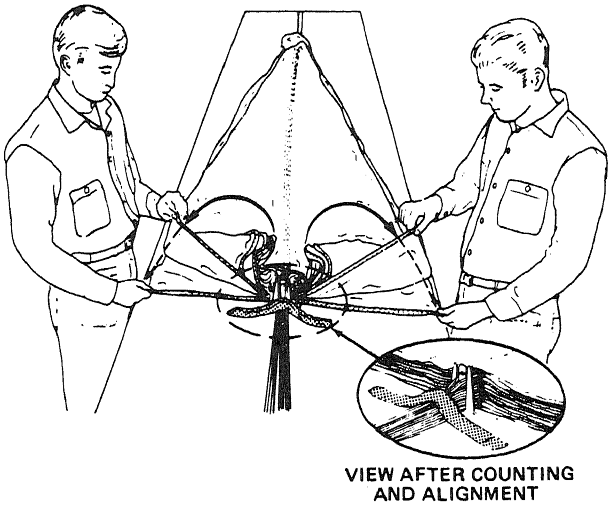
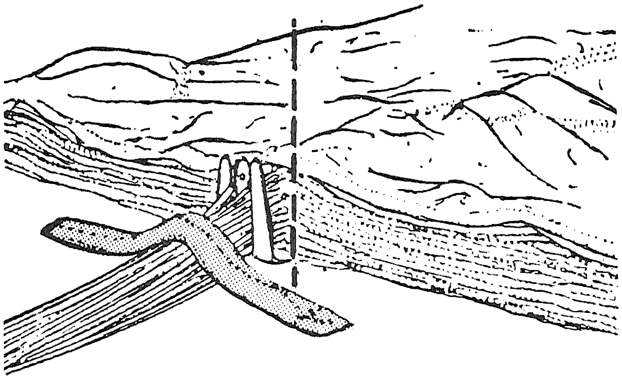
Figure 7-24.—Whipping and folding, step 15.



239.504
Figure 7-25.—Whipping and folding, step 16.



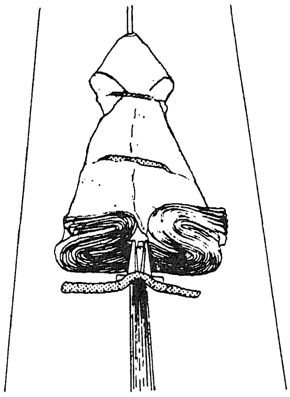
239.505
Figure 7-26.—Whipping and folding, step 17.

the distance to the peak. Place two shot bags on the top of the folded canopy and one behind the skirt hem. The whipping and folding operation is now complete and the canopy should appear as shown in figure 7-27.

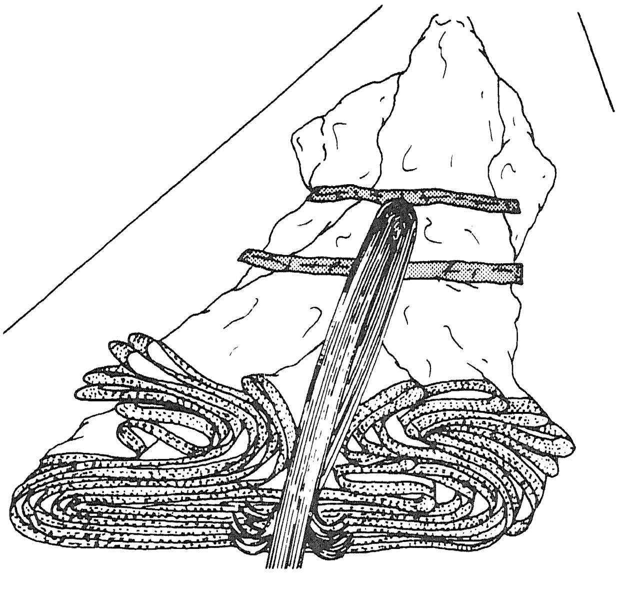
STOWAGE OF SUSPENSION LINES

To stow the suspension lines, proceed as follows:

Step 1. Remove the tension strap from the canopy peak but not from the anti-squid line tension cord.



239.506
Figure 7-27.—Whipping and folding, step 18.



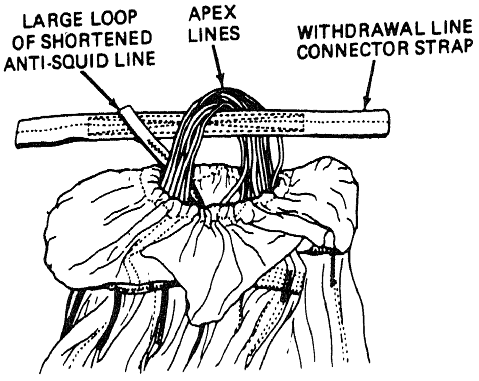
239.507
Figure 7-28.—Stowage of suspension lines, step 2.

Step 2. At a point about 14 feet 6 inches from the connector links, separate the suspension lines from the anti-squid lines. Your helper must hold the suspension lines out toward the sides of the table and you slide the canopy down the center of the table toward the connector links as shown in figure 7-28. As this is being done, the anti-squid lines, still attached to the tensioned

16-foot messenger line, are pulled to the top of the canopy and protrude through the vent hem. At this time remove the nylon messenger cord from the anti-squid lines at the canopy peak.

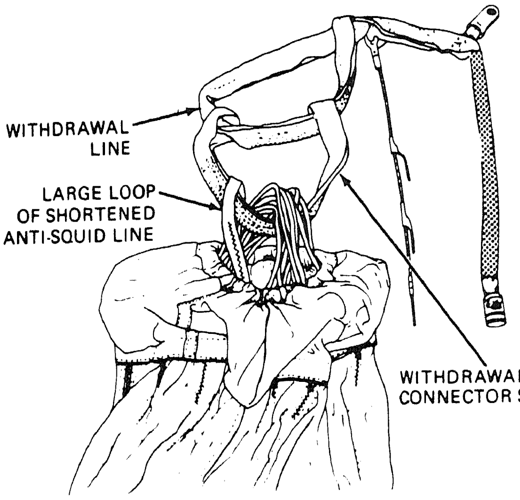
Step 3. Route the withdrawal line connector strap around the vent lines of the canopy and through the large loop of anti-squid line. (See figure 7-29.)

Step 4. Pass the withdrawal line through both loops in the withdrawal line connector strap and route the connector end of the withdrawal line through the withdrawal line loop (figure 7-30).


LARGE LOOP OF SHORTENED ANTI-SQUID LINE
APEX LINES
WITHDRAWAL LINE CONNECTOR STRAP

239.508

Figure 7-29.—Stowage of suspension lines, step 3.


WITHDRAWAL LINE
LARGE LOOP OF SHORTENED ANTI-SQUID LINE
WITHDRAWAL LINE CONNECTOR STRAP

239.509

Figure 7-30.—Stowage of suspension lines, step 4.

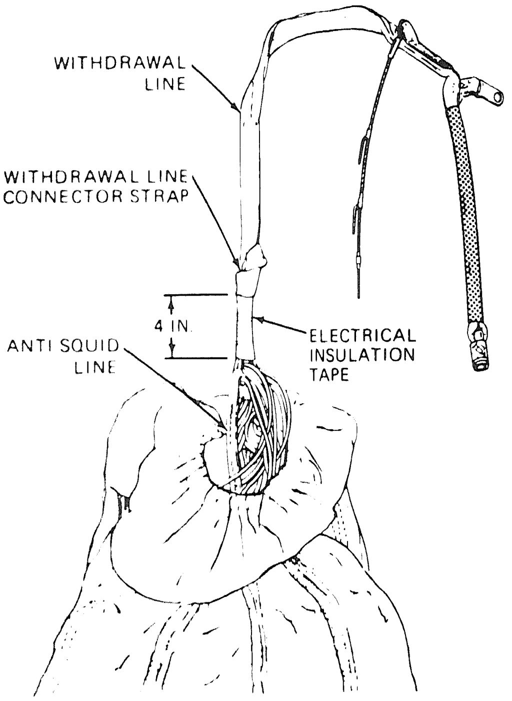
Step 5. Pull the remainder of the line through the loop and draw tight.

Step 6. Using 24 inches of 3/4-inch wide electrical tape (MIL-L-19166), tape the withdrawal line connector strap together for a distance of 4 inches between the lark's head knot of the withdrawal line and the vent line as shown in figure 7-31.

Step 7. Attach the pilot parachute to the vent lines using a lark's head knot. (See figure 7-32.)

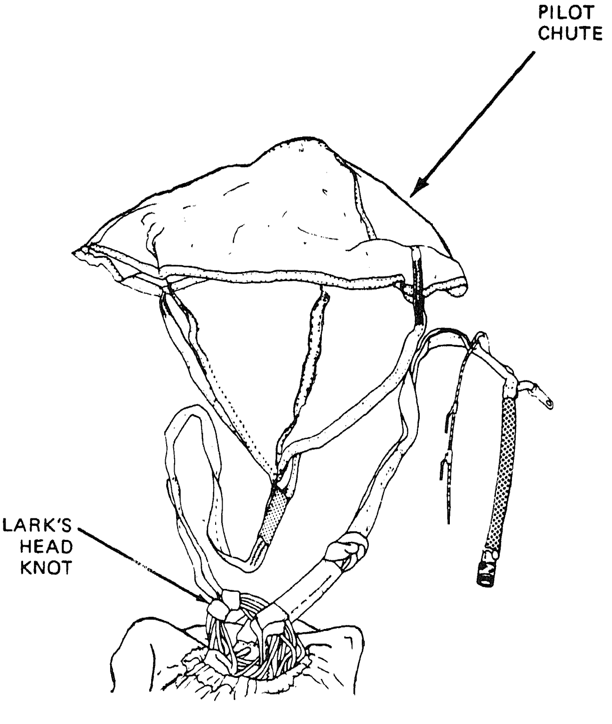
NOTE: All tacking cord shall be coated with a mixture of 50 percent paraffin and 50 percent beeswax except where otherwise noted. The cord may be dipped in a melting pot 70 to 90 degrees Celsius (160 to 200 degrees Fahrenheit) or drawn across a solid block of the mixture.

Step 8. Remove tension hooks and tie each group of connector links together on each side

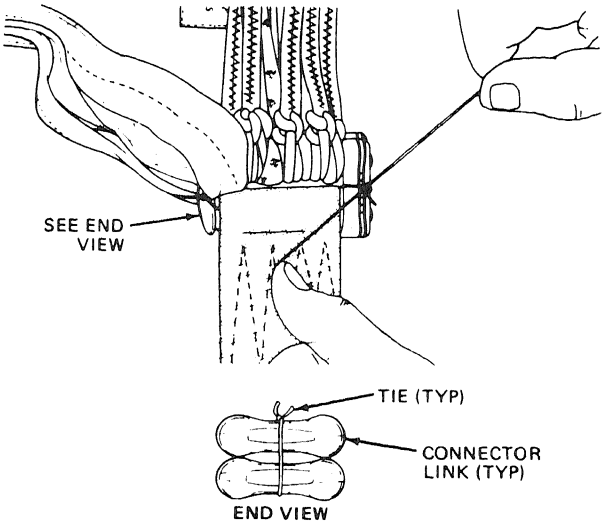


239.510

Figure 7-31.—Taping withdrawal lines, step 6.



239.511
Figure 7-32.—Attaching pilot chute, step 7.



LINK TIES (TYP, 4 PLACES)
(RISERS, SUSPENSION LINES
AND CROSS CONNECTOR STRAPS
ELIMINATED FOR CLARITY)

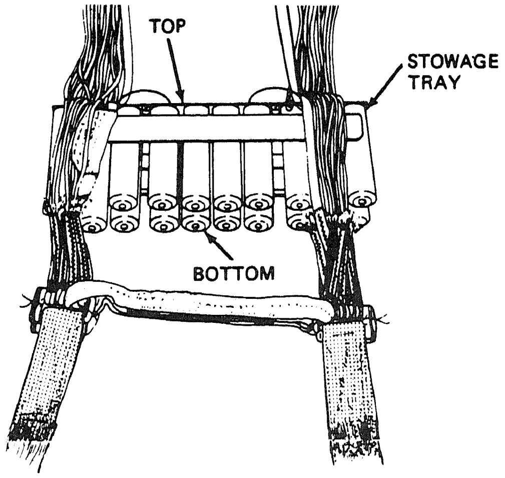
239.512
Figure 7-33.—Stowage of suspension lines, step 8.

using a waxed size FF nylon thread (V-T-295) single. Tie the ends with a surgeon's knot followed by a square knot as shown in figure 7-33.

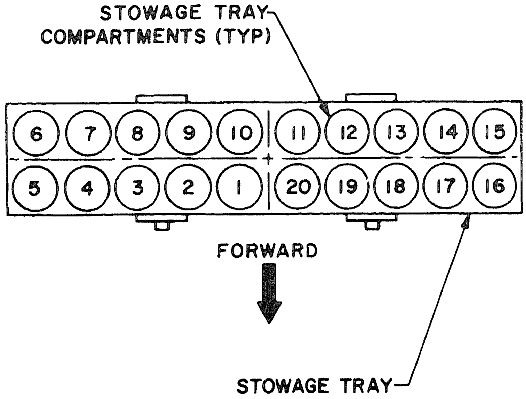
Step 9. Position the stowage tray under the suspension lines. Ensure the forward side is facing upward as shown in figure 7-34.

NOTE: Examine the condition of the stowage tray. Replacement of the stowage tray is authorized if it is necessary.

Step 10. The numerical sequence of the stowage tray compartments is shown in figure 7-35.



239.513
Figure 7-34.—Stowage of suspension lines, step 9.



239.514
Figure 7-35.—Stowage tray compartments.

Step 11. Your helper shall grasp the shortened anti-squid lines and place them outboard of the stowage tray on the helper's side.

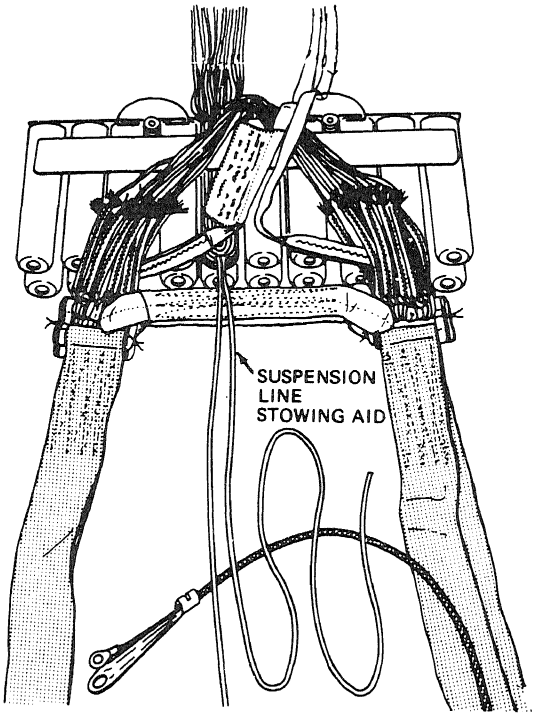
WARNING: The suspension line group on the helper's side must pass under the anti-squid lines before making the first stow. Do not stow the anti-squid lines until stow number 11, 12, or 13 as applicable.

Step 12. Utilizing the suspension line stowing aid, shown in figure 7-36, begin stowing only the suspension lines in stowage compartment number 1.

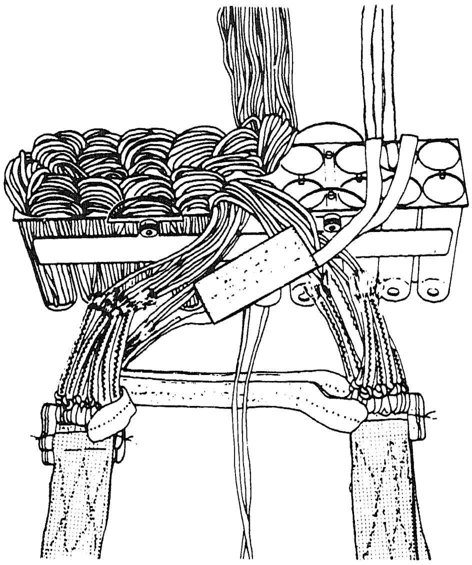
Step 13. Continue stowing the suspension lines in sequence until the suspension lines are approximately the same length as the shorter anti-squid lines (figure 7-37).

Step 14. Starting with stow 11, 12, or 13, stow both suspension and anti-squid lines.

Step 15. Ensure that 10 to 14 inches remain between the top of the stowage tray and the skirt of the canopy. Remaining suspension lines and the anti-squid lines may be stowed in stowage compartment 20 (Stow 20) to achieve specified dimension. You must use all stows except stow 20. However, use stow 20, if necessary. (See figure 7-38.)



239.515
Figure 7-36.—Stowage of suspension lines, step 12.



239.516
Figure 7-37.—Stowage of suspension lines, step 13.

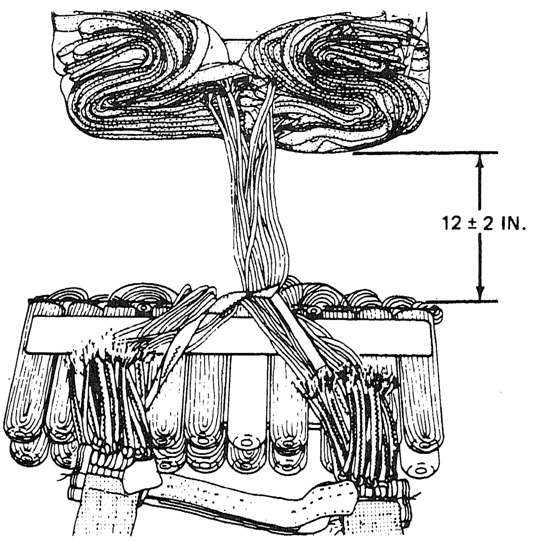
INSTALLATION OF STOWAGE TRAY IN CONTAINER

To install the stowage tray in the container, proceed as follows:

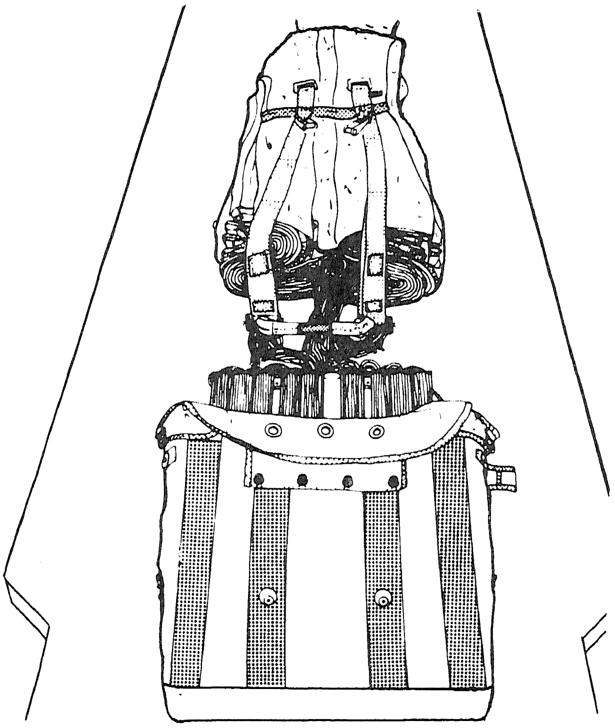
Step 1. Position the container on the packing table with the open end toward the stowage tray and all of the container flaps folded outward. Fold the risers over on to the canopy and move the container up to the stowage tray. The pile tape on the front of the container should be facing upward. (See figure 7-39.)

WARNING: Suspension lines and shortened anti-squid lines shall not be routed below the four screw attachment points.

Step 2. Insert the stowage tray into the container ensuring that none of the lines are disturbed. Push the tray evenly into the molded



239.517
Figure 7-38.—Stowage of suspension lines, step 15.



239.518
Figure 7-39.—Installation of stowage tray in container, step 1.

rubber stop until tray attachment points are aligned with those of the container. Ensure the suspension lines and anti-squid lines are not trapped under the stowage tray attachment points.

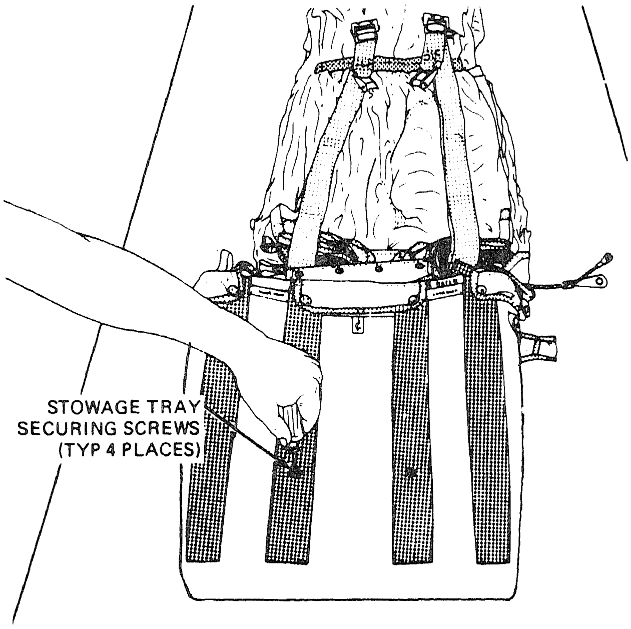
Step 3. Insert and tighten the four stowage tray securing screws as shown in figure 7-40.

Step 4. Position the risers and cross connector straps in the container. Align the hook tape on the risers and the cross connector strap with the pile tape located inside the container. When they are aligned press them firmly into place. Fold the remainder of the risers over onto the container as shown in figure 7-41.

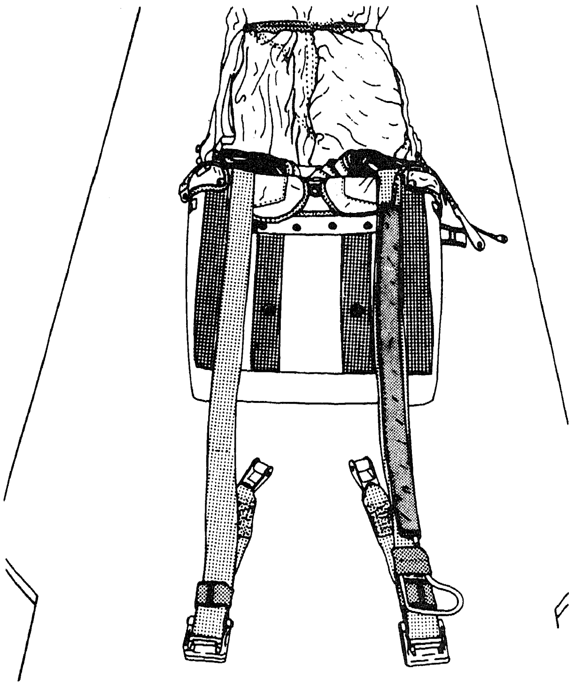
STOWAGE OF CANOPY

To stow the canopy, proceed as follows:

Step 1. Remove the shot bags and position the canopy S-folds eight inches apart (see figure 7-42).



239.519
Figure 7-40.—Installation of stowage tray in container, step 3.



239.520

Figure 7-41.—Installation of stowage tray in container, step 4.

Step 2. Place the container in a packing stand.

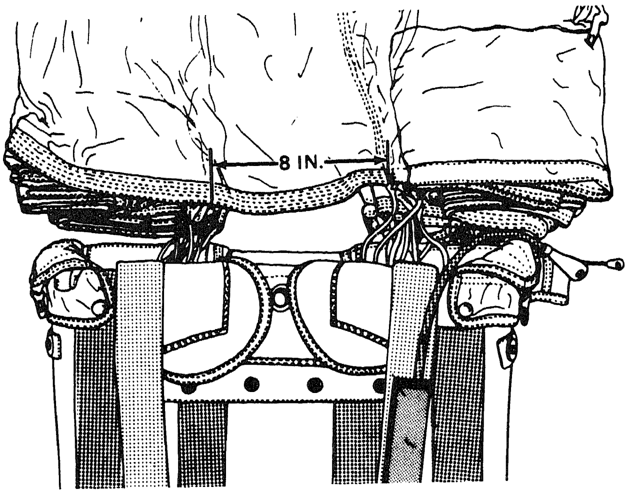
WARNING: You must use extreme care when stowing the canopy. Ensure that the risers and the cross connector strap do not separate from their fastener tape connection.

Step 3. Begin stowing the canopy by pushing the skirt as far down into the container as possible. This permits the bulk of the canopy to be positioned on the sides of the container as pictured in figure 7-43.

Step 4. Place a long bar between the canopy and the cross connector strap to keep the cross connector strap secured to the container during the canopy stowage.

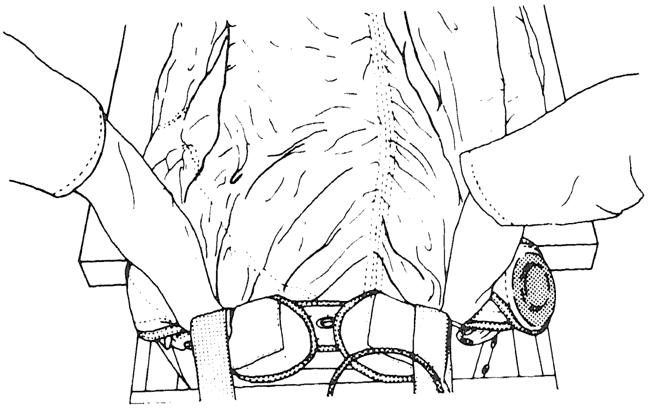
Step 5. Accordion fold the canopy, keeping the folds on your side of the parachute container. This will create a 4 1/2-inch void on your helper's side of the container as shown in figure 7-44. Continue stowing until five or six feet exists from the container to the apex of the canopy.

Step 6. The remaining five to six feet should exit the container on your helper's side. Remove the long bar from the container (see figure 7-45).



239.521

Figure 7-42.—Stowage of canopy, step 1.

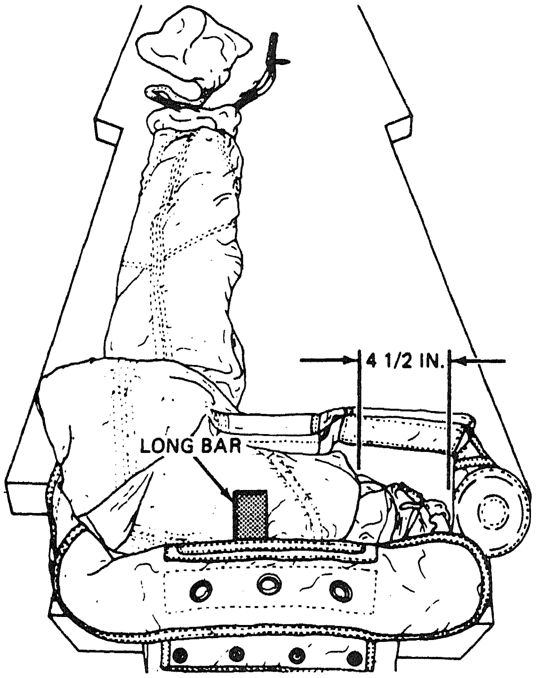


239.522

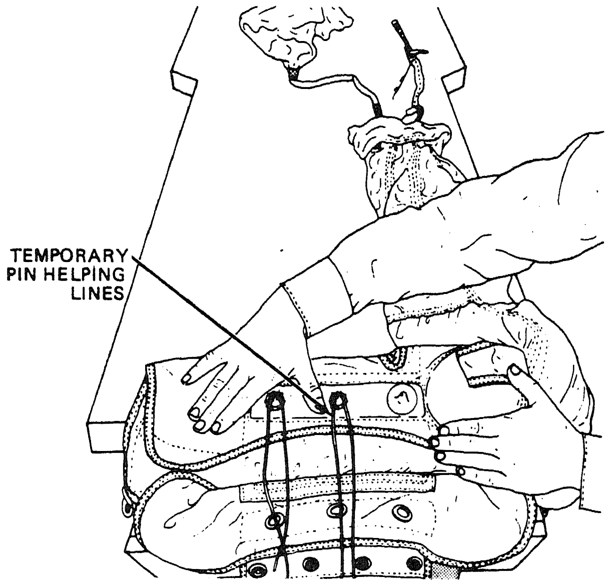
Figure 7-43.—Stowage of canopy, step 3.

Step 7. You should position the rear flap of the container over the canopy. This flap has the locking cones attached. Cut two pieces of Type I nylon cord approximately 18 inches long and temporarily insert the lines through the holes in the center of the locking cone (see figure 7-46).

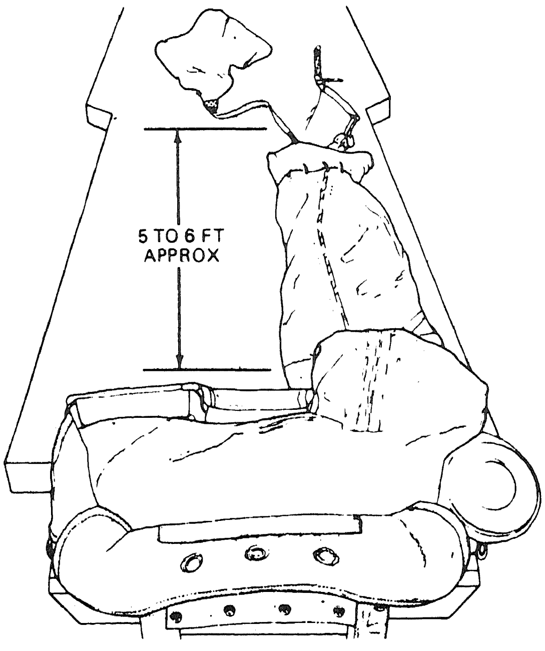
Step 8. Place the end protector flap on your side of the container into position. Route the two temporary helping lines through the grommets in the front flap (shown in figure 7-47).



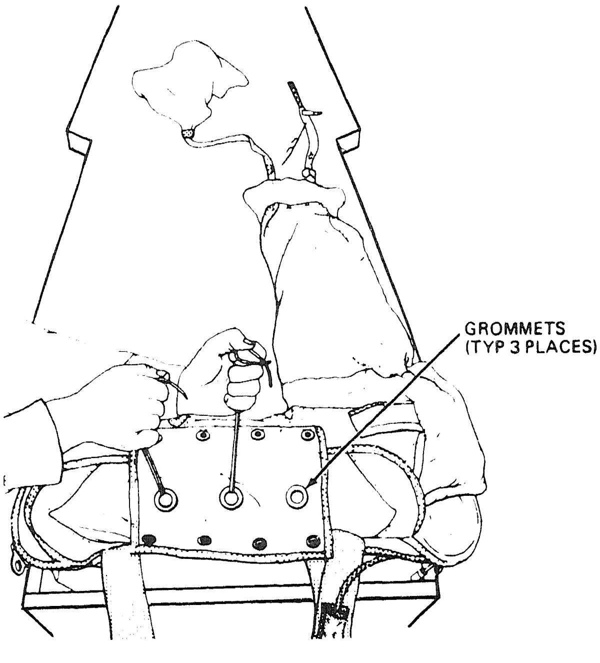
239.523
Figure 7-44.—Stowage of canopy, step 5.



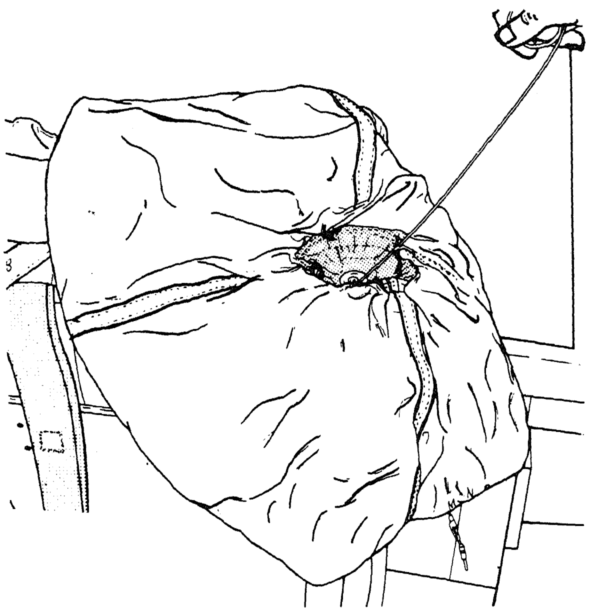
239.525
Figure 7-46.—Stowage of canopy, step 7.



239.524
Figure 7-45.—Stowage of canopy, step 6.

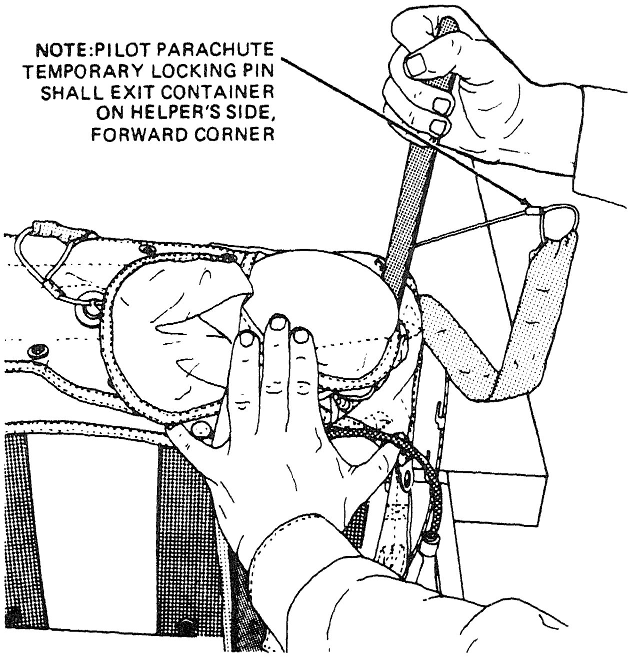


239.526
Figure 7-47.—Stowage of canopy, step 8.



239.533

Figure 7-54.—Stowing pilot chute, Step 6.


NOTE:PILOT PARACHUTE TEMPORARY LOCKING PIN SHALL EXIT CONTAINER ON HELPER'S SIDE, FORWARD CORNER

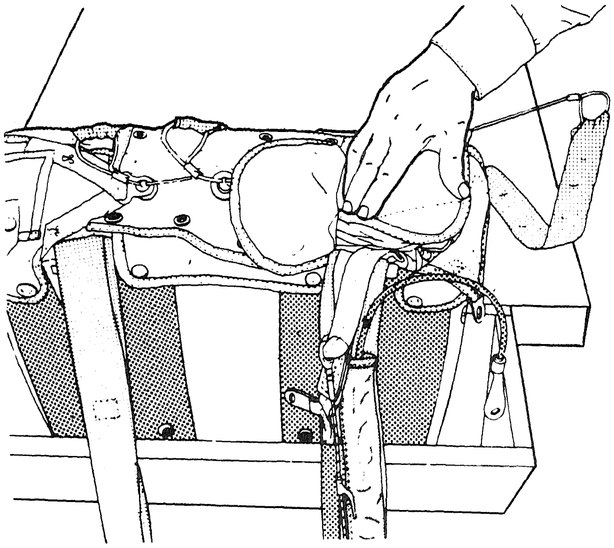
239.534

Figure 7-55.—Stowing pilot chute, Step 8.

Step 9. Accordion fold the withdrawal line behind the riser on the helper's side of the container (figure 7-56).

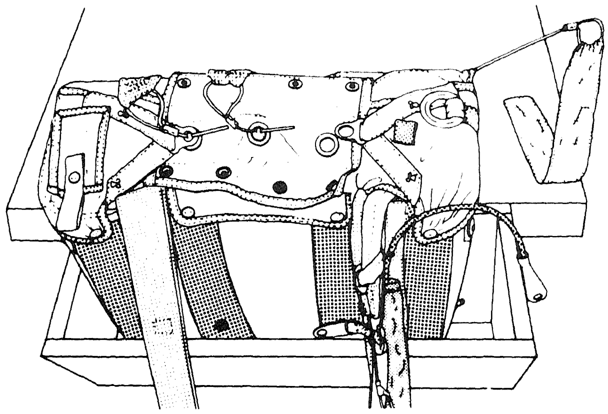
NOTE: Ensure 3 inches of line remains between the container and the ripcord cable attachment point.

Step 10. Position the end flap on the helper's side of the container into position (figure 7-57).



239.535

Figure 7-56.—Stowing withdrawal line, Step 9.



239.536

Figure 7-57.—Closing end flap, Step 10.

Step 11. Route the temporary pin helping lines through the cone on the helper's side of the container. Route the helping line through the grommet and pull taut thus drawing the front flap grommets over the rear flap locking cones. At this time the end flap on the helper's side of the container is pulled up and placed over the locking cone. Secure with temporary locking pins.

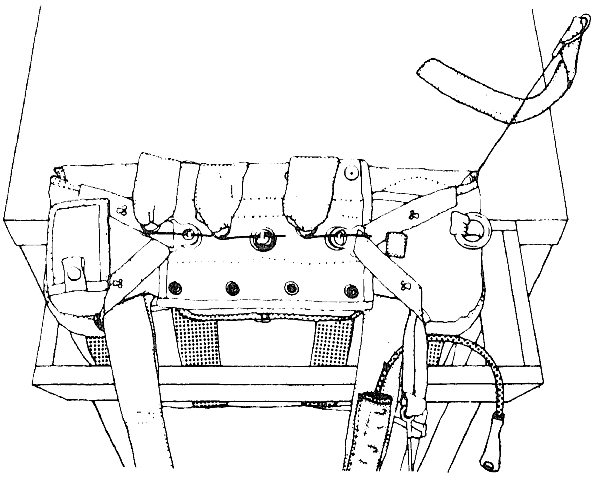
Step 12. Remove the temporary pin helping lines. If necessary, pull on the upper protector flap to compress the pack ends for end tab installation (figure 7-58).

Step 13. Pass the ripcord anchor plate through the webbing loop on the end flap.

WARNING: Make sure that the manual ripcord cable passes over the webbing loop.

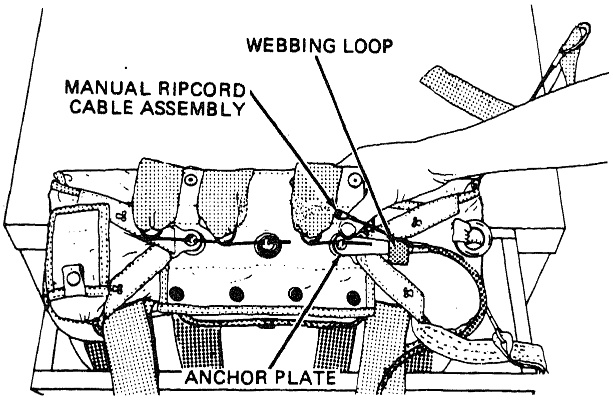
Your helper holds the end tab over the locking cone on the withdrawal line end of the container and you remove the temporary locking pin. You then position the anchor plate over the locking cone and insert a temporary locking pin (figure 7-59).

WARNING: In the next step be sure that the withdrawal line passes over the ripcord cable housing. Do not route the withdrawal line through the alignment ring.



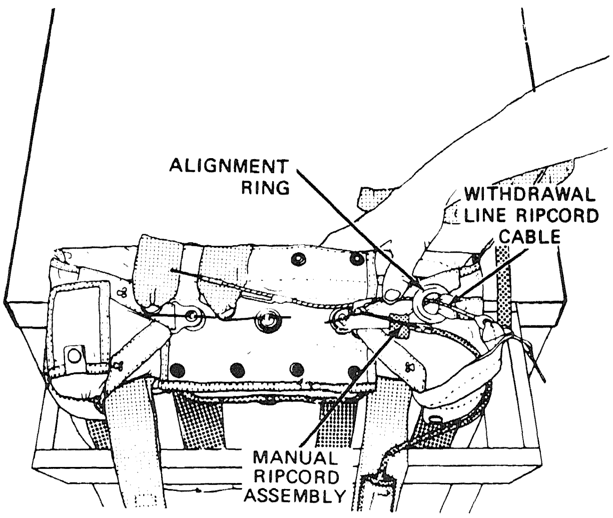
239.537

Figure 7-58.—Removing Temporary Locking Pins, Step 12.



239.538

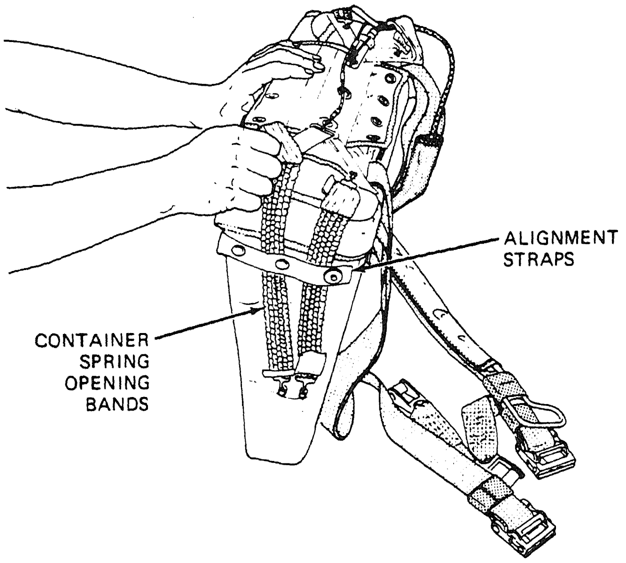
Figure 7-59.—Closing Container, Step 13.



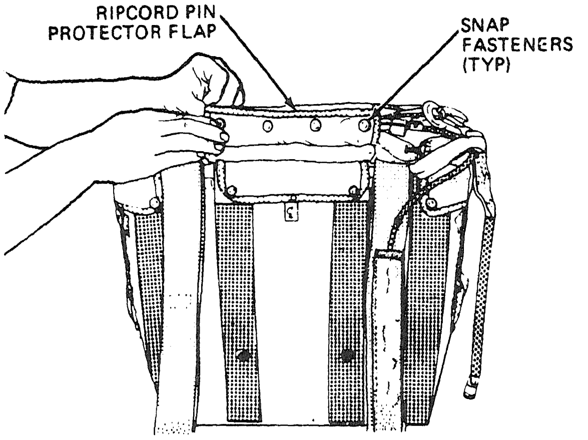
239.539

Figure 7-60.—Closing Container, Step 14.

Step 14. Route the ripcord cable through the alignment ring. Insert the curved ripcord pin through the eye on the end of the manual ripcord cable. Your helper shall partially insert the curved ripcord pin into the locking cone with the anchor plate as you remove the temporary locking pin. Insert the straight ripcord pin into the second and third locking cones in the same manner (figure 7-60).



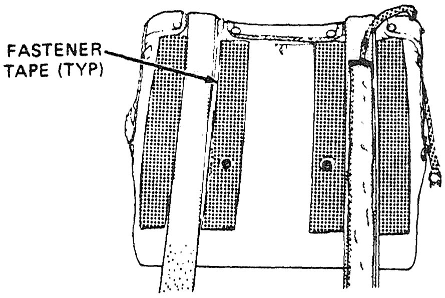
239.540
Figure 7-61.—Closing spring opening bands, Step 15.



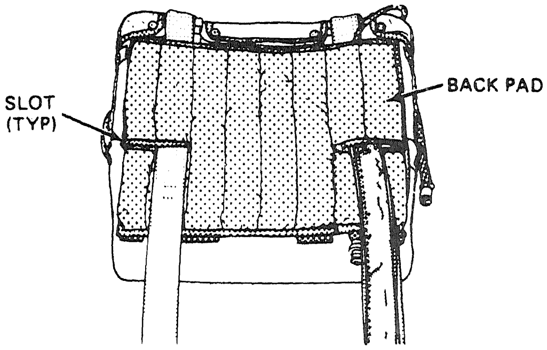
239.541
Figure 7-62.—Closing protector flaps, Step 16.

Step 15. Center all the ripcord pins in their respective cones.

WARNING: Ensure the ripcord pins are centered is the locking cones so that the shoulder of the ripcord pin in not jammed against the hole in the locking cone. Remove the pilot parachute temporary lock pin. Remove the container from the packing stand, route the container spring opening bands through the alignment straps and attach them to the container (figure 7-61).



239.542
Figure 7-63.—Routing risers, Step 17.



239.543
Figure 7-64.—Routing risers, Step 18.

Step 16. Close the ripcord pin protector flap by means of the four snap fasteners (figure 7-62).

Step 17. Lay the container on the table and route the risers between the pile tape on the front of the container assembly (figure 7-63).

Step 18. Align the hook tape on the back pad assembly with the pile tape on the container. Risers should exit through the slots in the back pad (see figure 7-64).

Step 19. Account for all packing tools.

Step 20. Now you should complete and sign the Parachute Configuration, Inspection and History Record. After checking for completeness and accuracy of all entries, the Collateral Duty Inspector shall also sign the Parachute Configuration, Inspection and History Record.

CHAPTER 8

INFLATABLE SURVIVAL EQUIPMENT

Naval aircraft making operational flights :r water are required to carry rafts which l accommodate all the assigned crew plus sengers. These rafts are manufactured in ious sizes and configurations to meet the nands of all types of aircraft.

Pneumatic rafts are compact assemblies, ich can be stowed in a small area. They should stowed so they are readily accessible, preferably ır an emergency exit. Never stow a raft under er equipment or cargo or near batteries. otect them from heaters, engines, auxiliary ver units, electronic tubes, and other sources heat.

If the aircraft flight manual designates a rage place for rafts, this space should be :d, unless you are otherwise directed by npetent authority. Whenever possible, stow ts in the same place in all aircraft of same model. This enables the crewmen become familiar with their location and ıs avoid confusion in the event of a ching.

Rafts are constructed of various types of berized, rubber-coated, rubber-impregnated, nylon cloth. Materials and components :d in the construction of liferafts should ıform to the applicable specifications and ıwings as listed or required in MIL-L-57D.

Liferafts are susceptible to damage from ıltreatment. However, when afloat at sea, they : surprisingly strong and durable, and have a ıacious stability. It is the responsibility of the to inspect, pack, and maintain all of the various types of rafts and related equipment carried in aircraft.

All inflatable survival equipment shall be subjected to periodic maintenance under the direction and control of the Maintenance/Material Control Officer of the activity to which the equipment is assigned. Maintenance shall be thorough at all times. No instance of careless treatment or willful neglect of inflatable survival equipment shall be allowed to pass unnoticed. The vital function of this equipment shall be uppermost in the minds of all personnel concerned. The periodic inspection cycles shall coincide with the specific aircraft inspection cycles specified in OPNAVINST 4790.2 (Series), or personal issue equipment cycle, as applicable.

To meet unusual situations and facilitate workload scheduling, a period of plus or minus one week, or portion thereof, may be applied to the authorized inflatable survival equipment calendar maintenance interval. A period of plus or minus 10% may be applied to equipment in phased maintenance aircraft.

LIFERAFTS

The five different types of liferafts used in Navy Aviation along with the names they originally bore are listed below:

NEW	OLD
LR-1	LR-1
LRU-12/A	MK-4
LRU-13/A	MK-7
LRU-14/A	MK-12
LRU-15/A	MK-20

You may be required to work on only one or you may work on all five. All five require the same three inspections, which are: Preflight, Special, and Calendar/Phase.

The Preflight Inspection shall be performed on fuselage-installed liferafts before the first flight of the day. This inspection is done by line personnel (plane captain or delegated aircrewman) who have been designated by the line division officer, instructed and found qualified by the Aviators Equipment Branch.

The Special Inspection is performed on fuselage-installed liferafts every 30 days. This inspection is made at the organizational level of maintenance by personnel assigned to the Aviators Equipment Branch. Upon completion of the inspection, the date of inspection and inspector's signature are entered in the inspections section of the Aviation Crew Systems History Card.

To perform a Preflight/Special Inspection, visually inspect for the following:

1. Fabric for cuts, tears, deterioration, and abrasion.
2. Seams for proper adhesion or stitching.
3. Straps and handles for security and wear.
4. Any other parts for wear, damage, and security.
5. All hardware for security of attachment, corrosion, damage, wear, and, if applicable, ease of operation.
6. Liferaft retaining line for proper stowage.

CAUTION

Do not open raft access doors, RSSK kits, or any sealed or safety-wired portion of liferaft for this inspection.

Subject each liferaft to the Calendar/Phase inspection before you place it in service, or if it is an aircraft inventory item, at the time of the aircraft Acceptance Inspection. Thereafter the Calendar/Phase Inspection interval coincides with the aircraft inspection cycle in which it is installed. See the applicable Planned Maintenance System (PMS) publications for specific intervals. In no case shall the interval exceed 225 days except that the LR-1 (RALSA) inspection is not to exceed 453 days. Unless operational requirements demand otherwise, the liferaft Calendar/Phase Inspection shall be performed at the intermediate level of maintenance or above.

The Acceptance/Calendar/Phase Inspection consists of the following major tasks (to be performed in the order listed):

Container/Case Inspection

Functional Test (if required)

Pull Cable Proof Load Test (if required)

Visual

Inflation Assembly Inspection

Leakage

Records Updating

Repacking

(Details are listed in NAVAIR 13-1-6.1.)

A functional test and pull cable proof load test shall be performed prior to placing a raft in service or during an aircraft Acceptance Inspection, and each fourth inspection cycle thereafter. You must make a leakage test at each inspection cycle. If the inspection indicates any damage beyond capability of maintenance, you must forward the entire assembly to supply.

DETERMINATION OF REPAIRABILITY

Liferafts shall be considered beyond repair for any of the following reasons:

1. Porous fabric areas on tubes.

2. Split or open tube seams.
3. Leakage test failure resulting from other than a cut, tear, or puncture.
4. Damaged or malfunctioning inlet valve, manifold, or oral inflation tube.
5. Damaged or malfunctioning topping-off valve that cannot be corrected by replacement of the topping-off valve opening insert.
6. Multiplace rafts (leaky bulkheads).

FUNCTIONAL TEST

Before functionally testing a liferaft, you should make sure you have enough area to inflate the liferaft. Remember to take into consideration the inflated size of the raft; an LRU-15/A will take 20 times the area that an LR-1 requires.

To begin the test, you first open the carrying case and unfold the liferaft. All liferafts have an inflation assembly, and by pulling an actuating cable, you automatically inflate the raft with CO_2.

When you do this, the raft should inflate to design shape, without evidence of restriction, in less than 1 minute. This is a CDI inspection point, so have a CDI inspector watching before you pull the cable. Once the raft is inflated, examine it for obvious defects such as cuts, tears, ruptured seams, and damaged manifold.

PULL CABLE PROOF LOAD TEST FOR MULTIPLACE RAFTS

The pull cable proof load test for multiplace rafts is done in conjunction with the functional test. Also, the test must be performed prior to placing an inflation assembly into service. First remove the inflation valve cover plate and remove the pull cable from the valve. Then apply a 50-lb pull force between the cable ball and the snaphook to determine if the cable is strong enough for the system.

Examine the pull cable for broken strands of wire, deformed snaphook, security of snaphook spring latch attachment, and loose or cracked swage fittings. If any damage is found, the pull cable shall be discarded and replaced with a new cable. The new cable shall also be tested. If the snaphook spring latch is loose, it may be repaired in accordance with instructions contained in NAVAIR 13-1-6.1.

If the pull cable passes this test, reinstall the cable. Refer to NAVAIR 13-1-6.1 for details of installation.

LEAKAGE TESTING

The only way that you can be sure that a liferaft does not have a leak is to perform a leakage test. To test the LRU-15/A with a vented Y-manifold for leakage, you must ensure that either the manifold inlet is capped or an empty cylinder is installed and the manifold inlet is in the CLOSED position. Install an equalizer tube clamp. These procedures are necessary for this raft due to its design. The LRU-15/A has two flotation tubes; one is on top of the other. The equalizer tube allows CO_2 or air pressure to enter both tubes at the same time. If you fail to cap the inlet, you will not be able to hold the pressure within the flotation tube. If you don't use an equalizer clamp you will blow up both flotation tubes.

NOTE: Flotation tubes must be tested separately to determine internal vertical bulkhead leakage.

All multiplace liferafts are filled with air pressure through the topping-off valves. The LR-1 is inflated through an oral inflation tube.

After you have reached the test pressure (table 8-1), shut off the air supply and wait 15 minutes. After 15 minutes, adjust the air pressure if necessary. At this time you must record the temperature and barometric pressure. This is done because any drop or rise in temperature or pressure affects the pressure within the flotation tube. Allow the raft to remain undisturbed for a minimum of 4 hours. At the end of 4 hours, check and record the test pressure and again record the temperature and barometric pressure

Table 8-1.—Liferaft test pressures

Raft type	Compartment	Leakage test pressure (psig)	Minimum pressure (psig)
LR-1	Raft Tube	2.0	1.60
LRU-7/P	Raft Tube	2.0	1.60
LRU-12/A and LRU-13/A	Bow Section	2.0	1.60
	*Inflatable Seat	1.0	0.60
	*Stern Section	2.0	1.60
LRU-14/A	Bow Section	2.0	1.60
	Stern Section	2.0	1.60
	*Upper Tube	1.0	0.60
	*Inflatable Floor Sections	1.0	0.60
	*Inflatable Seat	1.0	0.60
LRU-15/A	*Upper Tube	3.0	2.60
	*Lower Tube	3.0	2.60
	*Floor Support Tube	2.0	1.60
*Compartments may be tested simultaneously			

Table 8-2.—Example of temperature and barometric pressure check

UNCORRECTED TEST READING 1.70 PSI

	TEMP.	BARO.
START	75°F	29.90 IN. Hg
END	70°F	29.70 IN. Hg
DIFFERENCE	– 5°F	–.20
CORRECTION	+.155	–.098

TEMP. CORRECTION	+ .155
+ BARO. CORRECTION	– .098
CORRECTION	+ .057

UNCORRECTED READING	1.700 PSI
+ CORRECTION	+ .057
CORRECTED READING	1.757 PSI

Table 8-3.—Temperature conversion chart

Temperature Difference (Degree F.)	Correction (psi)
1	0.031
2	0.062
3	0.093
4	0.124
5	0.155
6	0.186
7	0.217
8	0.248
9	0.279
10	0.310

Rise in temperature: subtract from gauge reading.
Fall in temperature: add to gauge reading.

(see table 8-2) for an example. By using the conversion charts in tables 8-3 and 8-4, you can determine the correct reading for your raft. If your test pressure is within limits, you are ready to deflate the raft and repack the assembly. If the raft should fail this test, you must determine the cause. Information on testing for leaks can be found in chapter 2 of the publication, NAVAIR 13-1-6.1.

CLEANING

As you work on survival equipment you find that cleanliness is very important. It gives the equipment a longer service life and it reassures the aircrewman that he is using an operational piece of equipment. If he sees a dirty liferaft he may think it is old and that it might leak. To clean liferafts, prepare a solution of cleaning compound (MIL-C-25769) consisting of one part compound and three parts water. Apply the cleaning solution to soiled area with a spray or sponge. Allow the solution to remain on the surface for several minutes, then rub with a soft brush or rag. Rinse the surface thoroughly with water and wipe with a cloth or sponge. Repeat this application until the surface is free from all solution. Dry the raft with a lint-free cloth and apply a light coating of talcum powder.

HYDROSTATIC TEST OF CO_2 CYLINDERS

Every 5 years you must hydrostatically test the carbon dioxide cylinders used on multiplace liferafts. However, fully charged cylinders are considered serviceable regardless of the last hydrostatic test date. If a cylinder is both due for a test and discharged, disconnect it from the raft. Obtain a new cylinder from Supply as a replacement. Forward the old cylinder to Supply. (Cylinders shall be empty

Table 8-4.—Barometric pressure conversion chart

Press. Diff. (inHG)	Corr. (psi)	Press. Diff. (inHG)	Corr. (psi)	Press. Diff. (inHG)	Corr. (psi)	Press. Diff. (inHG)	Corr. (psi)	Press. Diff. (inHG)	Corr. (psi)
.01	.005	.16	.078	.31	.152	.46	.225	.61	.299
.02	.010	.17	.083	.32	.157	.47	.230	.62	.304
.03	.015	.18	.088	.33	.162	.48	.235	.63	.309
.04	.020	.19	.093	.34	.167	.49	.240	.64	.314
.05	.025	.20	.098	.35	.172	.50	.245	.65	.319
.06	.030	.21	.103	.36	.176	.51	.250	.66	.323
.07	.035	.22	.108	.37	.181	.52	.254	.67	.328
.08	.040	.23	.113	.38	.186	.53	.260	.68	.333
.09	.045	.24	.118	.39	.191	.54	.265	.69	.338
.10	.049	.25	.123	.40	.196	.55	.270	.70	.343
.11	.054	.26	.127	.41	.201	.56	.275	.71	.348
.12	.060	.27	.132	.42	.206	.57	.279	.72	.353
.13	.064	.28	.137	.43	.211	.58	.284	.73	.358
.14	.069	.29	.142	.44	.216	.59	.289	.74	.363
.15	.073	.30	.147	.45	.221	.60	.294	.75	.368

Rise in pressure: add to gauge reading.
Fall in pressure: subtract from gauge reading.

tension. The tape is applied in such a way that an equal amount of tape width is on each side of the seam edge which it covers.

To patch a damaged area on a liferaft, select the applicable color and type of raft cloth, depending on the type of raft to be repaired. Cut a rounded patch 1 inch larger than the damaged area on all sides. Scallop the edges of the patch if it is larger than 5 inches in diameter.

If the damaged area in the floor is larger than 1 inch, patches must be applied to both sides. Intermediate maintenance activities have the prerogative to declare rafts beyond the capability of maintenance if internal patching is required.

Center the patch over the damaged area and trace an outline of the patch on the raft fabric.

Cement the patch to the damaged area in accordance with the instructions previously discussed in this section. After all repairs have been made, perform a leakage test on the raft and dust the repaired area with talcum powder.

Bulkheads

The flotation tube is separated into two compartments by internal vertical bulkheads. Bulkheads are constructed of laminated cloth and are of a six-gore hemispherical design. The bulkheads are installed amidships, equidistant from the bow and stern so that the volume of the two compartments is equal. A 4-inch-diameter patch of laminated cloth is securely cemented to each side of the bulkhead, at the manifold, to protect the bulkhead against abrasion by the manifold diffusers when the raft is packed in the carrying case.

Inflatable Seats

An inflatable seat is installed in certain multiplace liferafts; for example, the LRU-12/A, LRU-13/A, and LRU-14/A. These seats are circular and are made of laminated cloth. The ends of the seat are tailored to fit the curvature of the flotation tube. The inflatable seat is an independent air chamber and is manually inflated through the topping-off valve by using the hand pump provided. It is attached to the bottom of the raft with Y-shaped hinge tapes made of laminated cloth. This method of attachment allows for expansion, and prevents undue stresses between the bottom of the raft and the seat.

Supply Pocket

Each LRU-12/A, LRU-13/A, and LRU-14/A liferaft contains a supply pocket which measures approximately 8 × 8 × 2 inches. The pocket is attached to the starboard side of the flotation tube surface inside the raft by stitching the pocket to a patch and cementing the patch to the tube. Using black wash-proof ink, ensure that each pocket is clearly marked SUPPLY POCKET in 1/2-inch letters on the LRU-12/A and LRU-13/A rafts. The lettering should be 1-inch high on the LRU-14/A supply pocket.

In addition to the starboard supply pocket, the LRU-14/A raft has a port supply pocket. This pocket is attached to the raft in the same manner as previously discussed. The lettering height on the port pocket is 1 inch for the first line and 1/4 inch for all other lines.

Combination Supply Pocket and Bailer

Each liferaft except the LRU-15/A contains one detachable combination supply pocket and bailer. The pocket is closed by means of a slide fastener across the top, which is sealed with tape after the equipment is packed. A loop of spring wire is contained in the seam around the slide fastener so that the pocket may be fashioned into a bailing container. One end of a 5-foot length of type III nylon suspension line is secured to the slide fastener wire stirrup pull; the other end is attached to the nearest lifeline patch loop.

The words SUPPLIES AND BAILER are stenciled in 1/2-inch letters on the pocket. Below this, stenciled in 1/4-inch letters, are the pocket contents.

Supply and Bailer Pocket on the STBD side of LRU-12/A, -13/A, and -14/A has been deleted from newly procured rafts. New rafts are not reworked to provide pocket and on older rafts they need not be removed.

Lifeline

A lifeline of natural color nylon rope, 1/4-inch diameter, encircles the outboard perimeter of the raft. The lifeline is attached to each lifeline patch loop with an overhand knot tied on the inner side of each patch loop so as to prevent the line from running free through the loops. Four inches of

NOTE: To make up the packaged liferaft assembly complete with accessories and survival items, all required components not supplied with the raft assembly must be individually requisitioned.

The LRU-12/A liferaft assembly (droppable) is inflated by pulling the inflation assembly actuating handle, located under the carrying case end flap. The LRU-12/A liferaft assembly (Raft Compartment Installation) is automatically inflated and ejected after the raft compartment door has been released. After boarding, the inflatable seat should be inflated through the topping off valves with the hand pump provided in the accessory container.

The LRU-12/A liferaft assembly can either be dropped to survivors or used by aircrewmen in the event of an aircraft ditching emergency. The raft is stowed in a readily accessible area inside the aircraft fuselage on all applicable aircraft except the E-1B and S-2 series.

Prior to packing any liferaft, the assembly must be updated by comparing the configuration of the assembly with the modifications listed in the applicable chapter in NAVAIR 13-1-6.1.

EQUIPMENT AND SURVIVAL ITEMS

Survival items are intended to provide a means for sustaining life, aiding in escape and evasion, and for a suitable detection capability. Survival items may be packed in liferafts, droppable kits, kits intended to be carried or worn by the aircrewmen, or they may be individually carried.

The equipment and survival items carried in the LRU-12/A liferaft assembly differ from that carried in other rafts basically in the quantity carried, with a few minor exceptions. Table 8-5 lists the survival item requirements and the applicable item storage container and pocket for LRU-12/A, LRU-13/A, LRU-14/A, and LRU-15/A liferafts.

Dye Marker

The dye marker is used to attract the attention of rescue aircraft. The dye is exhausted in 20 to 30 minutes and ceases to be a good target after 1 hour. The dye-exposed water area is visible at an approximate distance of 10 miles at 3,000-feet altitude. If rapid dispersion of the dye is desired, agitate the packet of dye vigorously in the water.

Water Storage Bags

The water storage bags are made of strong transparent plastic and hold 5 quarts of water. The open end is reinforced and is designed to hold itself in a closed position. To seal the bag, use the strap and buckle located near its end. The bag can be sealed tightly by rolling or folding its opening for a short distance, and by securing the folds with the strap and buckle.

When the bag is not being used for holding water, it can be used for stowage of items in need of protection from saltwater. Protecting articles in this manner can lead to contamination; therefore, articles should be wrapped in something to prevent lubricants and other contaminants from coming in direct contact with the interior of the bag. Water storage bags can also be inflated, coupled with one another, and used as water wings for swimming. Water storage bags are stowed in the accessory containers of rafts.

Signaling Mirror

The emergency signaling mirror is approximately 3 × 5 inches and consists of an aluminized reflecting mirror glass, a back cover glass, and a sighting device. It is used by personnel in rafts or on land to attract attention of passing aircraft or ships by reflection either in sunlight or in hazy weather. The reflections of this shatterproof mirror can be seen three to five times farther than a raft can be sighted at sea. On a clear sunny day, the mirror may reflect the equivalent of 8 million candlepower.

Table 8-5.—Liferaft survival item requirements and item storage containers for LRU-12/A, LRU-13/A, LRU-14/A, and LRU-15/A liferafts

Description	Quantity required			
	LRU-12/A	LRU-13/A	LRU-14/A	LRU-15/A*
Packed in Accessory Container				*All items packed in accessory container
Sea Dye Marker	3	4	5	6
Distress Signal, MK-13 Mod 0	4	6	8	10
Water Storage Bag (Size A)	2	3	4	7
Desalter Kit or	2	4	6	10
Canned Drinking Water[1]	4	7	12	20
Can Opener[2]	1	1	1	2
First Aid Kit	1	1	1	
Sunburn Preventive Cream	1	1	2	3
Rations	4	7	12	20
Bailing Sponge	1	1	2	2
Hand Pump Type I or	—	1	—	—
Hand Pump Type II or	1	—	—	—
Hand Pump Type III	—	1	1	1
Blanket	1	1	2	1
Hand Generated Flashlight[3]	1	1	1	1
Sealing Clamp	—	—	—	2
Packed in Supply Pocket				
Flare Gun MK-79 Mod 0	1	1	1	2
Signal Light (Strobe) SDU-5/E	1	1	1	1
Signal Light (Steady Burning), SDU-30	1	1	1	1
Signal Mirror[4]	1	1	1	1
Survival Radio[5,6] or Radio Beacon AN/URT-33 with Battery[7]	1	1	1	1
Code Card[8]	1	1	1	1
Compass, Pocket or Wrist	1	1	1	1
Pocket Knife	1	1	1	1
Cord, Nylon, Utility, 50 feet	1	1	1	1

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[1] The desalter kits, Types I and II, shall be utilized in lieu of canned water until stocks are depleted. Kits manufactured prior to 1961 are over-age. All other kits have an indefinite service life and should remain in service until they have been damaged.

[2] Cutting edges shall be wrapped with a layer of wide paper tape.

[3] Required for Arctic missions; optional otherwise.

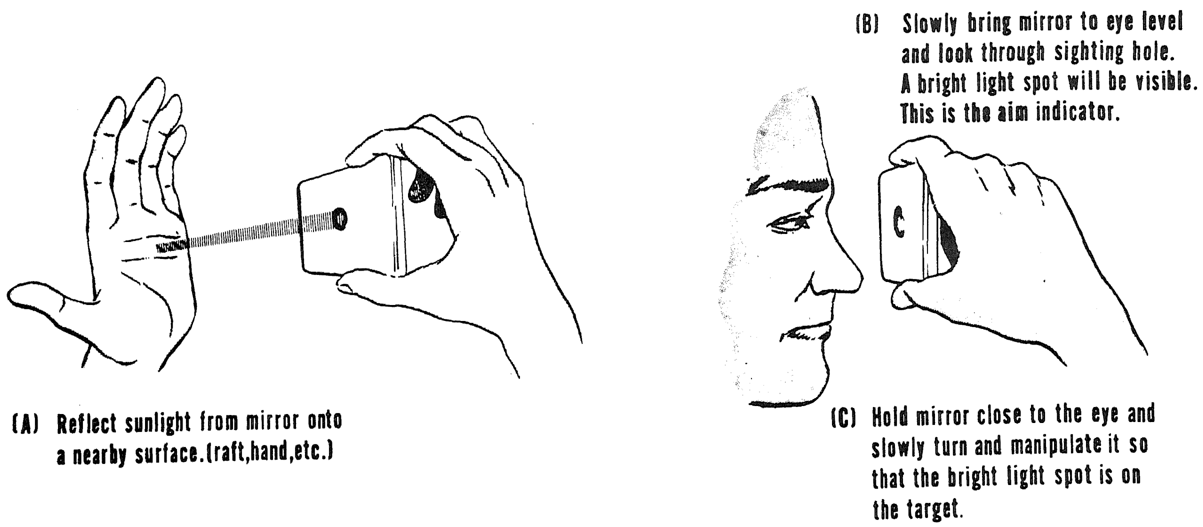
[4] The Type II mirror (large) shall be used in lieu of the Type I mirror (small) until stock of the Type II mirror is depleted.

[5] Stock levels may dictate a particular survival radio be used. This will be directed by the Area Commander. If no type survival radio is available, each liferaft should have an AN/URT-33 Beacon.

[6] For P-3 type aircraft only: PRT-5 or CRT-3/3A Transmitters (two per aircraft). PRT-5 will be packed in accessory container.

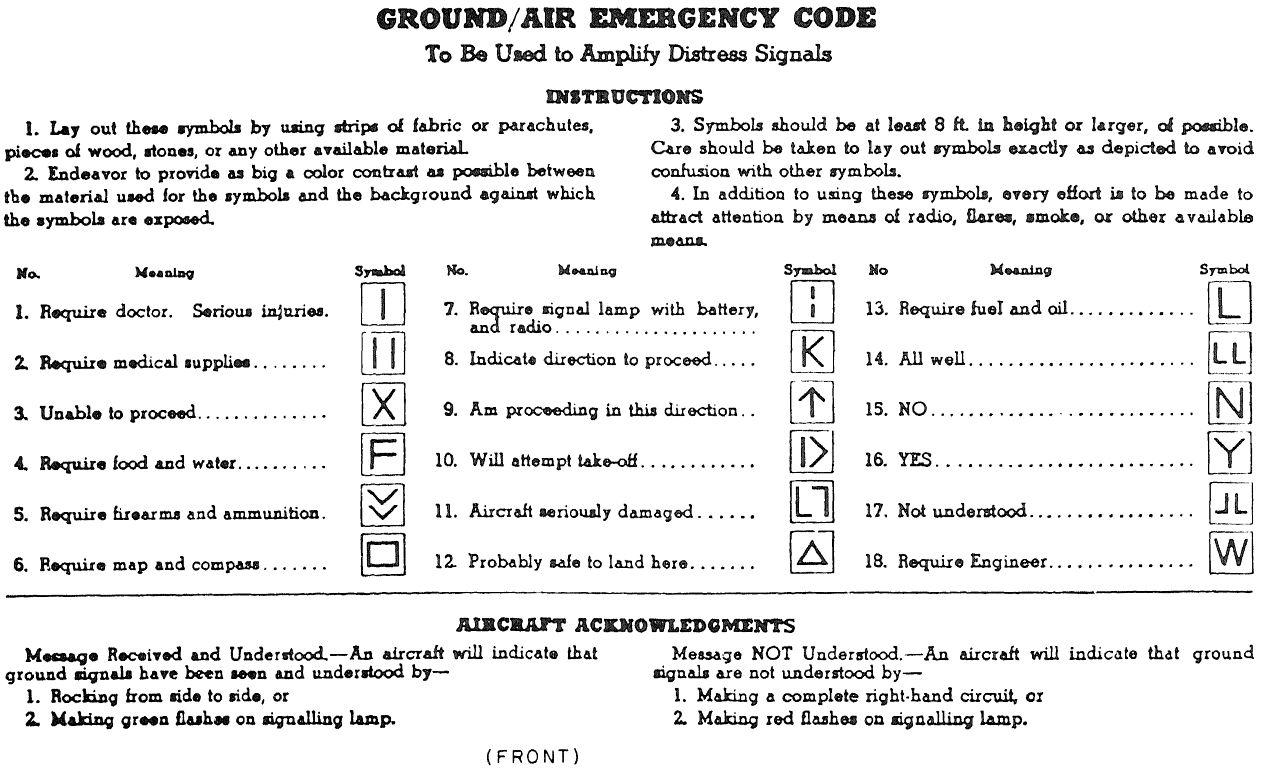
[7] The service life of the battery used in radio beacon AN/URT-33 and AN/URT-33A shall be 2 years from the date of manufacture or 225 days from the date of installation, whichever occurs first. Ensure that the battey service life does not expire prior to the next scheduled calendar inspection.

[8] Order from Naval Publications and Forms Center, stock number 0800-LP-000-1500.


(B) Slowly bring mirror to eye level and look through sighting hole. A bright light spot will be visible. This is the aim indicator.
(A) Reflect sunlight from mirror onto a nearby surface.(raft,hand,etc.)
(C) Hold mirror close to the eye and slowly turn and manipulate it so that the bright light spot is on the target.

239.340

Figure 8-3.—Operation of the signaling mirror.



GROUND/AIR EMERGENCY CODE

To Be Used to Amplify Distress Signals

INSTRUCTIONS

1. Lay out these symbols by using strips of fabric or parachutes, pieces of wood, stones, or any other available material.

2. Endeavor to provide as big a color contrast as possible between the material used for the symbols and the background against which the symbols are exposed.

3. Symbols should be at least 8 ft. in height or larger, if possible. Care should be taken to lay out symbols exactly as depicted to avoid confusion with other symbols.

4. In addition to using these symbols, every effort is to be made to attract attention by means of radio, flares, smoke, or other available means.

No.	Meaning	Symbol	No.	Meaning	Symbol	No	Meaning	Symbol
1.	Require doctor. Serious injuries.	I	7.	Require signal lamp with battery, and radio	¦	13.	Require fuel and oil	L
2.	Require medical supplies	II	8.	Indicate direction to proceed	K	14.	All well	LL
3.	Unable to proceed	X	9.	Am proceeding in this direction	↑	15.	NO	N
4.	Require food and water	F	10.	Will attempt take-off	I>	16.	YES	Y
5.	Require firearms and ammunition	⩔	11.	Aircraft seriously damaged	L7	17.	Not understood	JL
6.	Require map and compass	□	12.	Probably safe to land here	△	18.	Require Engineer	W

AIRCRAFT ACKNOWLEDGMENTS

Message Received and Understood.—An aircraft will indicate that ground signals have been seen and understood by—

1. Rocking from side to side, or
2. Making green flashes on signalling lamp.

Message NOT Understood.—An aircraft will indicate that ground signals are not understood by—

1. Making a complete right-hand circuit, or
2. Making red flashes on signalling lamp.

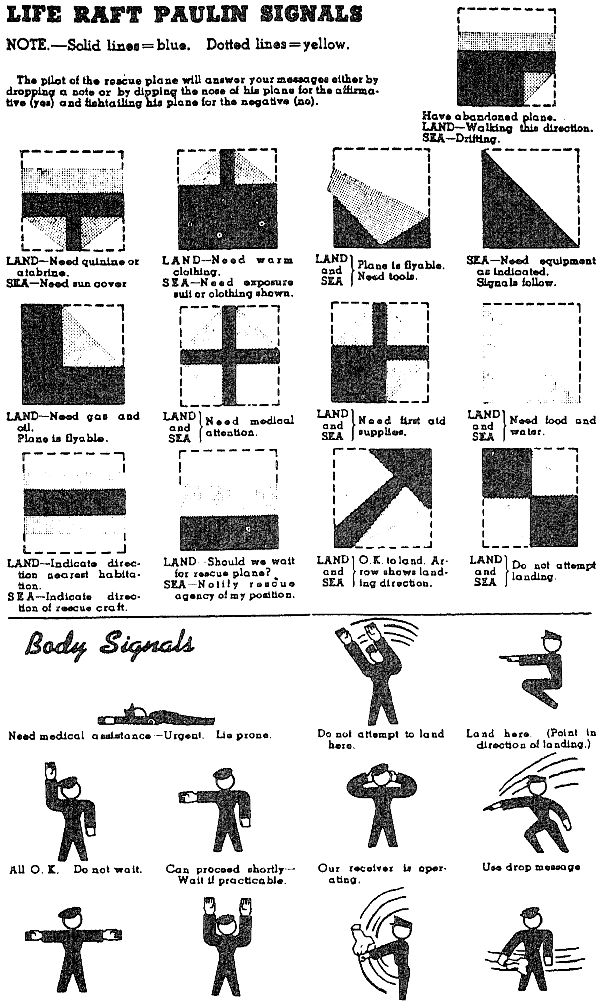
(FRONT)

239.334

Figure 8-4.—Code card, ground/air emergency (front).

Flashes from the mirror have been seen from a distance of 40 miles.

Figure 8-3 illustrates the operation of the signaling mirror. Past experience indicates that personnel may have difficulty using the mirror in a bobbling raft at sea. Practice signaling with the mirror on the ground should be encouraged as part of the training program for flight crews. Such practice could reduce the difficulty in case of an emergency. Before using the mirror, read the instructions printed on the back of the mirror.


LIFE RAFT PAULIN SIGNALS
NOTE.—Solid lines=blue. Dotted lines=yellow.
The pilot of the rescue plane will answer your messages either by dropping a note or by dipping the nose of his plane for the affirmative (yes) and fishtailing his plane for the negative (no).
Have abandoned plane. LAND—Walking this direction. SEA—Drifting.
LAND—Need quinine or atabrine. SEA—Need sun cover
LAND—Need warm clothing. SEA—Need exposure suit or clothing shown.
LAND and SEA Plane is flyable. Need tools.
SEA—Need equipment as indicated. Signals follow.
LAND—Need gas and oil. Plane is flyable.
LAND and SEA Need medical attention.
LAND and SEA Need first aid supplies.
LAND and SEA Need food and water.
LAND—Indicate direction nearest habitation. SEA—Indicate direction of rescue craft.
LAND—Should we wait for rescue plane? SEA—Notify rescue agency of my position.
LAND and SEA O.K. to land. Arrow shows landing direction.
LAND and SEA Do not attempt landing.
Body Signals
Need medical assistance—Urgent. Lie prone.
Do not attempt to land here.
Land here. (Point in direction of landing.)
All O. K. Do not wait.
Can proceed shortly—Wait if practicable.
Our receiver is operating.
Use drop message
Need mechanical help or parts—Long delay.
Pick us up—Plane abandoned.
Affirmative (Yes)
Negative (No)
(BACK)

239.334.1

Figure 8-4.—Code card, ground/air emergency (back).

Nylon Cord

Nylon cord can be used to construct fish nets, snares, secure spring traps, tie down a windbreak, construct a bow or sling, repair clothes, construct a ladder, and as a fishing line. Nylon cord is provided in 50-foot lengths and has a breaking strength of 100 pounds.

Pocket Compass

The magnetic card type compass is encased in a cylindrical transparent plastic cover with a reference line inscribed on the top of the case. A circular card swings on a jeweled bearing, while a centered pivot supports and suspends the card in its free movement.

To cage the compass and protect the jeweled bearing, it is stored in an inverted position. The compass is reasonably shockproof, but it should be handled with care if one is to expect reliable readings. Damage to the case could impair its waterproof qualities and promote corrosion in spite of its internal corrosion-resistant construction. Fittings outside of the base adapt the compass for wrist wear. One compass is provided for each raft and is stowed in the supply pocket.

The magnetic compass is primarily used for navigating purposes. A compass can also be used to locate iron-base stones (lodestones). Iron-base stones and flint, quartz, or some type of sandstone can be used to strike a fire.

Code Card

The ground/air emergency code card, shown in figure 8-4 (front and back) contains aircraft distress signals, aircraft acknowledgment signals, liferaft paulin signals, and body signals. These signals should be used when communications equipment is not operable, when no communications equipment is available, or when radio silence is required.

First Aid Kit

The first aid kit contains various medical supplies to prevent diseases or to aid injured or sick personnel. First aid kits or medical supplies may be included as part of a survival kit. The kits are stored in the accessory container.

Pocket Knife

The pocket knife consists of one large blade, a combination screwdriver and bottle opener, and one can opener. The pocket knife is a general purpose survival tool. It can be used to cut wood or material, open cans, prepare food, and as a weapon. When in a raft, one should never let the opened knife dangle from its lanyard or lie on the bottom of the raft.

Signal Lights

Distress signal lights are used to attract the attention of SAR aircraft, ships, or ground rescue parties. The SDU-5/E (strobe light) emits a high intensity flashing light visible for great distances. The 761-A (Matrix light) emits a steady light that is beamed, by a special lens, at the horizon, 45° and straight up. It can also be used as a flashlight.

Sunburn Ointment

Sunburn ointment should be applied before exposure to the sun. For most effective results, rub the ointment well into the skin. The ointment can be used in this same way to give protection from windburn in cold areas.

Paulin Life Saving

The paulin is a piece of rubber-coated, nylon fabric in two sizes dependent upon the raft size. The coated side is nonreflective blue and the other side is bright red. The paulin may be used as a raft cover or signaling device at sea, and as a tent or signaling device on land. Liferaft paulin signals are printed on the GND/AIR emergency code form (see figure 8-4, back side).

Hand Pump

The hand pump is used to inflate liferaft seats, inflatable floors and other compartments not inflated by the liferaft inflation assembly. The pump is also used to top off an inflated raft or maintain inflation of a leaky raft.

Rations

Ration packets contain candy and gum. Rations are not primarily items for subsistence but they do produce energy.

Bailing Sponge

One or more sponges may be included in the liferaft assemblies. They can be used to catch rain water, bail out a raft, for personal hygiene, as fishing bait (a small piece soaked in animal blood), and for other purposes.

Whistle

The whistle is used for attracting attention of a rescue ship or personnel in foggy weather or at night.

SPECIAL WHISTLE INSPECTION.—To inspect the whistle, proceed as follows:

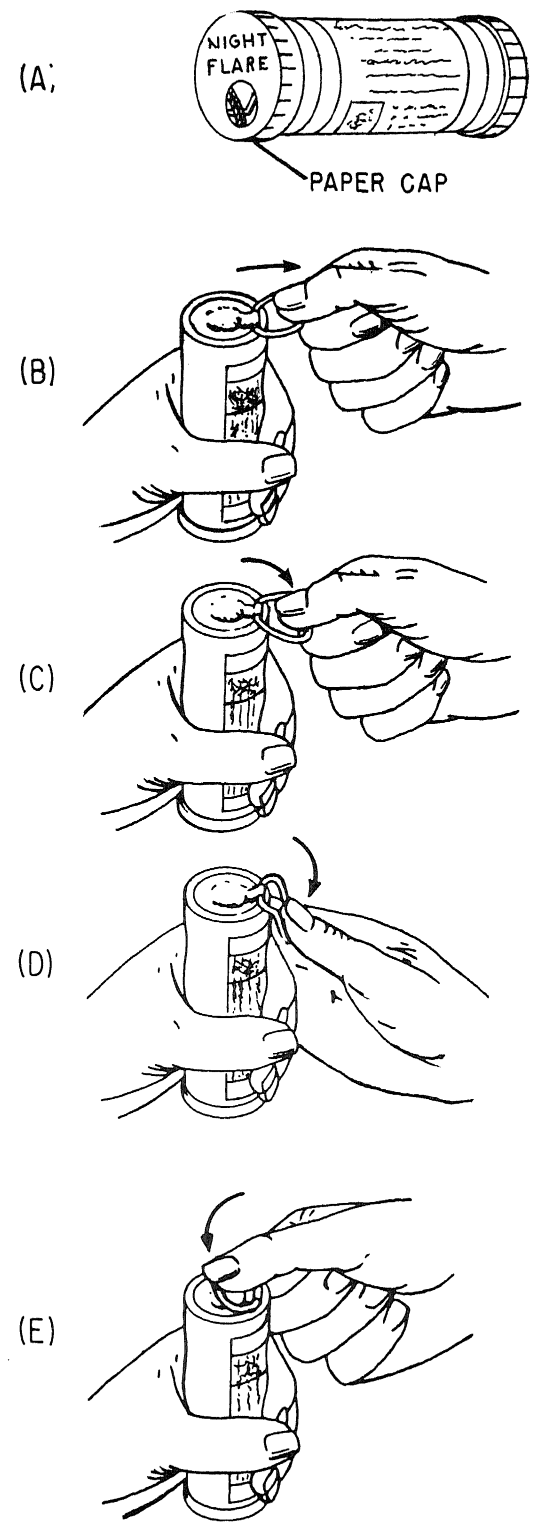
1. Ensure that the whistle side disks are not loose or missing. Inspect the whistle for cracks and damage to the ball. Damaged or defective whistles must be replaced.

2. The whistle should be blown with a normal blow (regular exhalation); it should also be blown with an over blow (forced exhalation). If the whistle fails to emit a highly audible sound, it should be replaced.

Distress Signal Day/Night MK-13 Mod 0

This signal is used to attract the attention of SAR aircraft and to give pickup aircraft the wind drift direction. The night end of the flare produces a red flame and the day end produces an orange smoke. Each end burns for approximately 20 seconds.

The night flare can be identified in the dark by a series of small beadlike projections that are embossed around its circumference. After selecting the flare to be used, the sealing tape should then be torn off from around the end of the cylinder and the paper cap removed. Figure 8-5 illustrates the step-by-step procedures for using the Mk 13 Mod 0 distress signal. Grasp the pull ring and flip it over the rim of the signal case as shown in (B). Press down the over-hanging ring with your thumb until the seal snaps, as shown in (C). If the seal refuses to snap with this kind of force, continue pressing on the ring so that it bends over the rim and against the signal body as shown in (D). Flip the bent ring back to the top of the signal and press down (E), using the bent pull ring as a lever. After the seal breaks, point the signal away from your face and body and give a sharp yank on the pull ring. Hold the signal at an angle of approximately 45 ° from the horizontal with your arm fully extended. Care should be taken not to drop any of the contents on the user or the raft. After one end of the signal has been expended, it may be cooled by immersing in water and then saved until both ends have been used. The distress signal should be cool before being stored.



239.343

Figure 8-5.—Igniting the MK-13 Mod 0 distress signal.

Desalter Kit

The desalter kit is used to make fresh water from salt water. Each chemical desalting briquet can purify 16 ounces of water.

The desalter kit consists of a hinged metal container with a retaining lanyard, seven or eight wrapped desalting briquets, a length of mending tape, and a plastic bag for processing the water to be desalted. The briquets, processing bag, and mending tape are attached to a nylon tie tape, to each other, and to the metal container. The desalter kits are stowed in the accessory container.

The plastic bag should be rinsed to decrease the taste which passes into the treated water. This is done by filling the bag one-third full of seawater and rubbing the inner surfaces of the bag gently for 2 minutes, then rinsing several times with fresh seawater.

The chemical process is purposely adjusted to leave a little salt in the desalted water to compensate for perspiration losses. If a less salty taste is desired, a smaller amount of water can be used in the bag.

slack is allowed in the line between the lifeline patch loops. Each completed lifeline patch can withstand a 250-pound pull exerted in a direction perpendicular to the base of the patch.

The lifeline provides a means for securing the accessory containers to the liferaft by using a 10-foot length of type III nylon cord.

The LRU-15/A liferaft also has an inner lifeline that provides for the safety and survival of aircrewmen.

Righting Handles

Righting handles are provided on all liferafts except the LRU-15/A. These handles provide a means of righting a capsized raft.

Topping-Off Valves

Topping-off valves are installed on each flotation tube, inflatable seat, each section of inflatable floors, and each side of the floor supports. The required number of topping-off valves and their location on the rafts may vary depending on the type of raft concerned.

Topping-off valves are used for manual inflation purposes in conjunction with the hand pump. The valve also serves as a means for relieving high internal tube pressure that may possibly build up during hot, sunny days.

Two topping-off valves are installed on the same side of the raft's main flotation tube, one on each side of the internal bulkhead, above the inside horizontal centerline of the tube, 4 inches from the point of attachment of the vertical internal bulkhead.

Stenciled instructions relative to topping-off and deflation of the raft are applied on the raft flotation tube adjacent to the topping-off valves. Appearing in 1/4-inch, wash-proof black ink letters, the instructions are stenciled on a white rubber patch as follows:

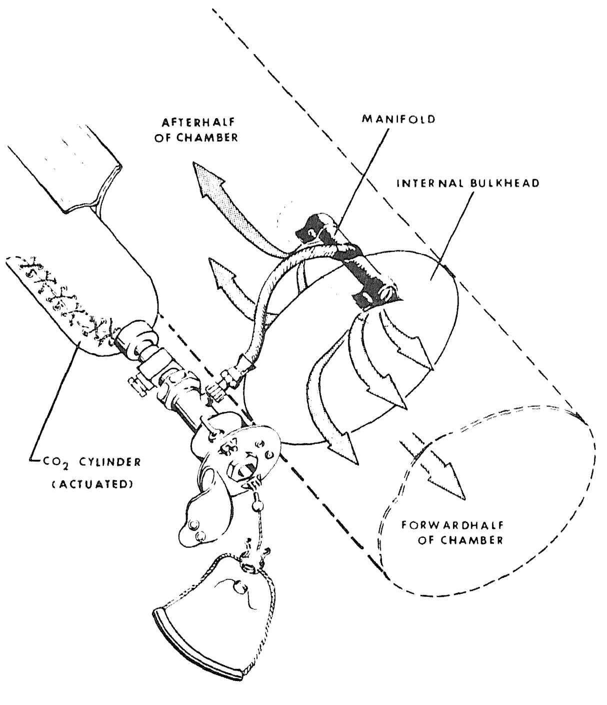
> TO INFLATE COMPARTMENTS MANUALLY: Attach hand pump to valve cap, unscrew cap 1 1/2 turns to the right and then pump to inflate. When desired pressure is attained, retighten valve cap and remove pump.
>
> TO DECREASE PRESSURE: Open valve 1 1/2 turns to the right and bleed.

Inflation System

The valve of the CO_2 cylinder is threaded into the coupling nut of the manifold. Since multiplace liferafts are constructed with internal bulkheads, the purpose of the manifold is to provide a common means of directing and diffusing the flow of carbon dioxide entering the raft inflatable tube chamber. The manifold outlets must bridge the internal bulkhead over which they are mounted. Figure 8-1 illustrates the operation of the raft CO_2 inflation system manifold.

All of the exposed metal surfaces of the inflation system which might chafe the raft fabric while packed must be covered with several layers of rubber-coated cloth, and secured with cloth-based, pressure-sensitive tape.

Due to space limitation, this chapter cannot possibly contain all of the available information concerning liferafts. The Inflatable Survival Equipment Manual, NAVAIR 13-1-6.1, is referenced for more detailed information.



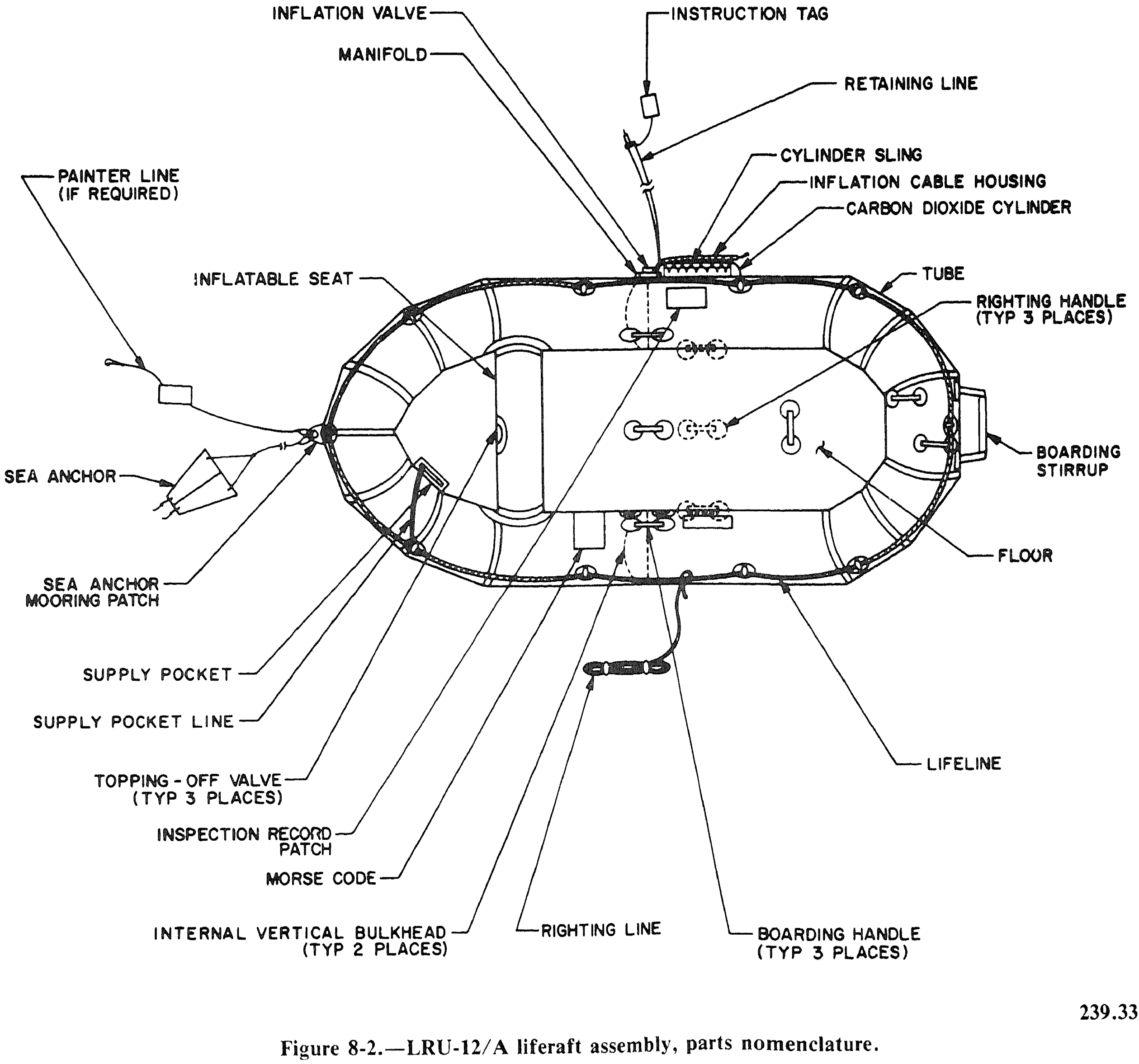
239.338

Figure 8-1.—Multiplace raft CO_2 inflation system manifold operation.

LRU-12/A LIFERAFT ASSEMBLY

The LRU-12/A liferaft assembly consists of an inflation assembly (carbon dioxide cylinder and inflation valve) and a four-man raft. Two types of carbon dioxide cylinders and four types of inflation valves are approved for service use. The liferaft is made up of a two-compartment main tube; an inflatable seat attached to the main tube; a noninflatable floor attached to the bottom of the main tube and inflatable seat; and a sea anchor which is used to retard drifting. A lifeline, a righting line, a supply pocket, and a combination supply pocket and bailer are attached to the main tube.

Boarding and righting handles are attached to the main tube and the floor. Emergency survival equipment and raft accessories, stowed in accessory containers, are provided for the safety and survival of the aircrewmen. The lifeline also provides a means for securing the accessory containers to the liferaft. Topping-off valves are located on the main tube and inflatable seat. An LRU-12/A liferaft is shown in figure 8-2.



239.339

Figure 8-2.—LRU-12/A liferaft assembly, parts nomenclature.

NOTE: To make up the packaged liferaft assembly complete with accessories and survival items, all required components not supplied with the raft assembly must be individually requisitioned.

The LRU-12/A liferaft assembly (droppable) is inflated by pulling the inflation assembly actuating handle, located under the carrying case end flap. The LRU-12/A liferaft assembly (Raft Compartment Installation) is automatically inflated and ejected after the raft compartment door has been released. After boarding, the inflatable seat should be inflated through the topping off valves with the hand pump provided in the accessory container.

The LRU-12/A liferaft assembly can either be dropped to survivors or used by aircrewmen in the event of an aircraft ditching emergency. The raft is stowed in a readily accessible area inside the aircraft fuselage on all applicable aircraft except the E-1B and S-2 series.

Prior to packing any liferaft, the assembly must be updated by comparing the configuration of the assembly with the modifications listed in the applicable chapter in NAVAIR 13-1-6.1.

EQUIPMENT AND SURVIVAL ITEMS

Survival items are intended to provide a means for sustaining life, aiding in escape and evasion, and for a suitable detection capability. Survival items may be packed in liferafts, droppable kits, kits intended to be carried or worn by the aircrewmen, or they may be individually carried.

The equipment and survival items carried in the LRU-12/A liferaft assembly differ from that carried in other rafts basically in the quantity carried, with a few minor exceptions. Table 8-5 lists the survival item requirements and the applicable item storage container and pocket for LRU-12/A, LRU-13/A, LRU-14/A, and LRU-15/A liferafts.

Dye Marker

The dye marker is used to attract the attention of rescue aircraft. The dye is exhausted in 20 to 30 minutes and ceases to be a good target after 1 hour. The dye-exposed water area is visible at an approximate distance of 10 miles at 3,000-feet altitude. If rapid dispersion of the dye is desired, agitate the packet of dye vigorously in the water.

Water Storage Bags

The water storage bags are made of strong transparent plastic and hold 5 quarts of water. The open end is reinforced and is designed to hold itself in a closed position. To seal the bag, use the strap and buckle located near its end. The bag can be sealed tightly by rolling or folding its opening for a short distance, and by securing the folds with the strap and buckle.

When the bag is not being used for holding water, it can be used for stowage of items in need of protection from saltwater. Protecting articles in this manner can lead to contamination; therefore, articles should be wrapped in something to prevent lubricants and other contaminants from coming in direct contact with the interior of the bag. Water storage bags can also be inflated, coupled with one another, and used as water wings for swimming. Water storage bags are stowed in the accessory containers of rafts.

Signaling Mirror

The emergency signaling mirror is approximately 3 × 5 inches and consists of an aluminized reflecting mirror glass, a back cover glass, and a sighting device. It is used by personnel in rafts or on land to attract attention of passing aircraft or ships by reflection either in sunlight or in hazy weather. The reflections of this shatterproof mirror can be seen three to five times farther than a raft can be sighted at sea. On a clear sunny day, the mirror may reflect the equivalent of 8 million candlepower.

Table 8-5.—Liferaft survival item requirements and item storage containers for LRU-12/A, LRU-13/A, LRU-14/A, and LRU-15/A liferafts

	Quantity required			
Description	LRU-12/A	LRU-13/A	LRU-14/A	LRU-15/A*
Packed in Accessory Container				*All items packed in accessory container
Sea Dye Marker	3	4	5	6
Distress Signal, MK-13 Mod 0	4	6	8	10
Water Storage Bag (Size A)	2	3	4	7
Desalter Kit or	2	4	6	10
Canned Drinking Water[1]	4	7	12	20
Can Opener[2]	1	1	1	2
First Aid Kit	1	1	1	
Sunburn Preventive Cream	1	1	2	3
Rations	4	7	12	20
Bailing Sponge	1	1	2	2
Hand Pump Type I or	—	1	—	—
Hand Pump Type II or	1	—	—	—
Hand Pump Type III	—	1	1	1
Blanket	1	1	2	1
Hand Generated Flashlight[3]	1	1	1	1
Sealing Clamp	—	—	—	2
Packed in Supply Pocket				
Flare Gun MK-79 Mod 0	1	1	1	2
Signal Light (Strobe) SDU-5/E	1	1	1	1
Signal Light (Steady Burning), SDU-30	1	1	1	1
Signal Mirror[4]	1	1	1	1
Survival Radio[5,6] or Radio Beacon AN/URT-33 with Battery [7]	1	1	1	1
Code Card[8]	1	1	1	1
Compass, Pocket or Wrist	1	1	1	1
Pocket Knife	1	1	1	1
Cord, Nylon, Utility, 50 feet	1	1	1	1

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[1] The desalter kits, Types I and II, shall be utilized in lieu of canned water until stocks are depleted. Kits manufactured prior to 1961 are over-age. All other kits have an indefinite service life and should remain in service until they have been damaged.

[2] Cutting edges shall be wrapped with a layer of wide paper tape.

[3] Required for Arctic missions; optional otherwise.

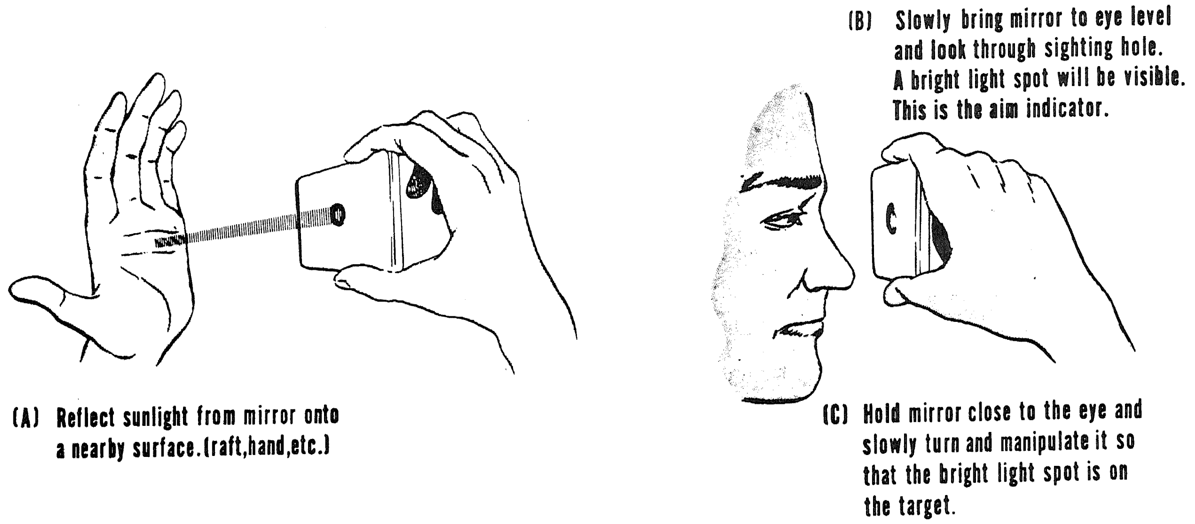
[4] The Type II mirror (large) shall be used in lieu of the Type I mirror (small) until stock of the Type II mirror is depleted.

[5] Stock levels may dictate a particular survival radio be used. This will be directed by the Area Commander. If no type survival radio is available, each liferaft should have an AN/URT-33 Beacon.

[6] For P-3 type aircraft only: PRT-5 or CRT-3/3A Transmitters (two per aircraft). PRT-5 will be packed in accessory container.

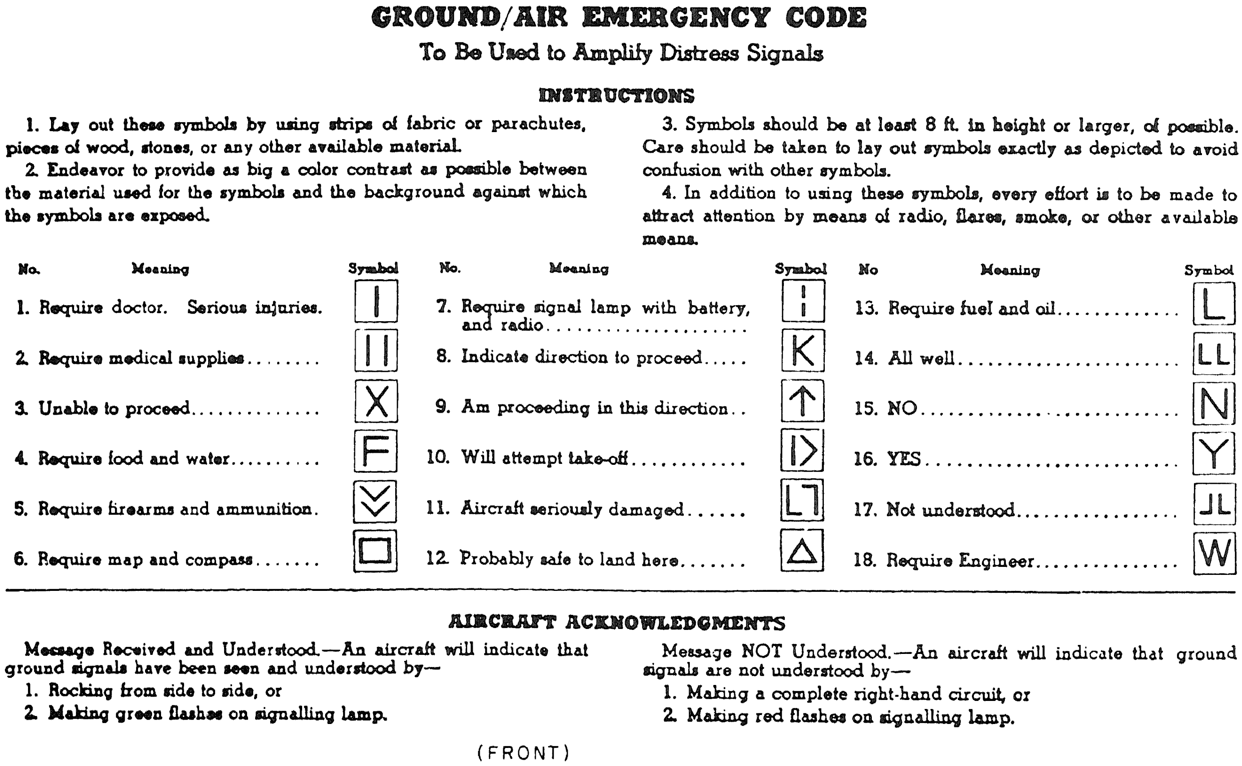
[7] The service life of the battery used in radio beacon AN/URT-33 and AN/URT-33A shall be 2 years from the date of manufacture or 225 days from the date of installation, whichever occurs first. Ensure that the battey service life does not expire prior to the next scheduled calendar inspection.

[8] Order from Naval Publications and Forms Center, stock number 0800-LP-000-1500.


(B) Slowly bring mirror to eye level and look through sighting hole. A bright light spot will be visible. This is the aim indicator.
(A) Reflect sunlight from mirror onto a nearby surface.(raft,hand,etc.)
(C) Hold mirror close to the eye and slowly turn and manipulate it so that the bright light spot is on the target.

239.340

Figure 8-3.—Operation of the signaling mirror.



GROUND/AIR EMERGENCY CODE

To Be Used to Amplify Distress Signals

INSTRUCTIONS

1. Lay out these symbols by using strips of fabric or parachutes, pieces of wood, stones, or any other available material.
2. Endeavor to provide as big a color contrast as possible between the material used for the symbols and the background against which the symbols are exposed.
3. Symbols should be at least 8 ft. in height or larger, of possible. Care should be taken to lay out symbols exactly as depicted to avoid confusion with other symbols.
4. In addition to using these symbols, every effort is to be made to attract attention by means of radio, flares, smoke, or other available means.

No.	Meaning	Symbol	No.	Meaning	Symbol	No	Meaning	Symbol
1.	Require doctor. Serious injuries.	I	7.	Require signal lamp with battery, and radio....................	¦	13.	Require fuel and oil............	L
2.	Require medical supplies........	II	8.	Indicate direction to proceed.....	K	14.	All well.......................	LL
3.	Unable to proceed..............	X	9.	Am proceeding in this direction..	↑	15.	NO............................	N
4.	Require food and water..........	F	10.	Will attempt take-off............	I>	16.	YES..........................	Y
5.	Require firearms and ammunition.	︾	11.	Aircraft seriously damaged......	L7	17.	Not understood.................	JL
6.	Require map and compass.......	□	12.	Probably safe to land here.......	△	18.	Require Engineer...............	W

AIRCRAFT ACKNOWLEDGMENTS

Message Received and Understood.—An aircraft will indicate that ground signals have been seen and understood by—

1. Rocking from side to side, or
2. Making green flashes on signalling lamp.

Message NOT Understood.—An aircraft will indicate that ground signals are not understood by—

1. Making a complete right-hand circuit, or
2. Making red flashes on signalling lamp.

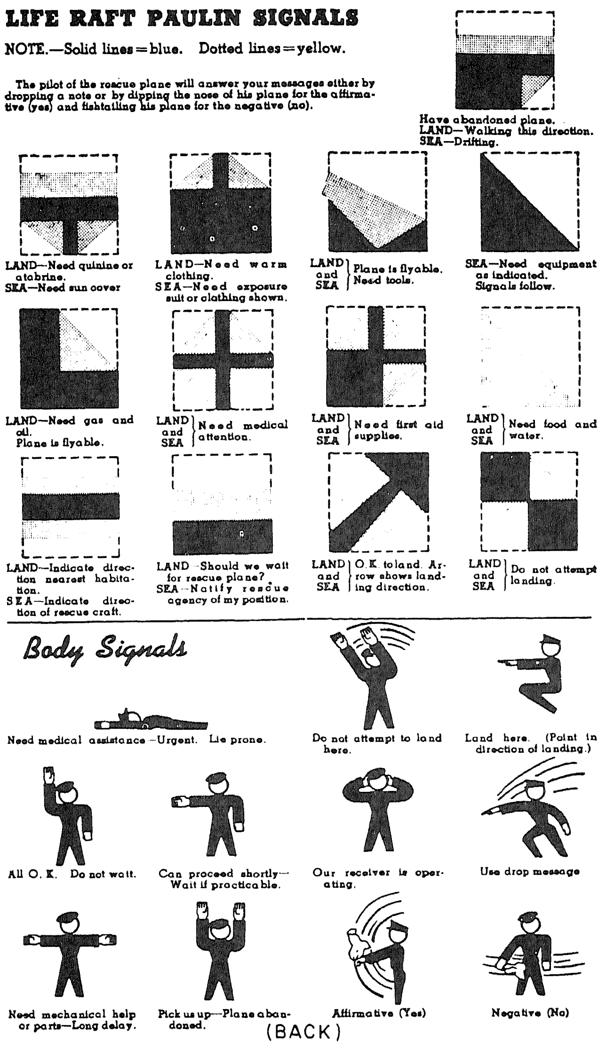
(FRONT)

239.334

Figure 8-4.—Code card, ground/air emergency (front).

Flashes from the mirror have been seen from a distance of 40 miles.

Figure 8-3 illustrates the operation of the signaling mirror. Past experience indicates that personnel may have difficulty using the mirror in a bobbling raft at sea. Practice signaling with the mirror on the ground should be encouraged as part of the training program for flight crews. Such practice could reduce the difficulty in case of an emergency. Before using the mirror, read the instructions printed on the back of the mirror.


LIFE RAFT PAULIN SIGNALS
NOTE.—Solid lines=blue. Dotted lines=yellow.
The pilot of the rescue plane will answer your messages either by dropping a note or by dipping the nose of his plane for the affirmative (yes) and fishtailing his plane for the negative (no).
Have abandoned plane. LAND—Walking this direction. SEA—Drifting.
LAND—Need quinine or atabrine. SEA—Need sun cover
LAND—Need warm clothing. SEA—Need exposure suit or clothing shown.
LAND and SEA Plane is flyable. Need tools.
SEA—Need equipment as indicated. Signals follow.
LAND—Need gas and oil. Plane is flyable.
LAND and SEA Need medical attention.
LAND and SEA Need first aid supplies.
LAND and SEA Need food and water.
LAND—Indicate direction nearest habitation. SEA—Indicate direction of rescue craft.
LAND—Should we wait for rescue plane? SEA—Notify rescue agency of my position.
LAND and SEA O.K. to land. Arrow shows landing direction.
LAND and SEA Do not attempt landing.
Body Signals
Need medical assistance—Urgent. Lie prone.
Do not attempt to land here.
Land here. (Point in direction of landing.)
All O. K. Do not wait.
Can proceed shortly—Wait if practicable.
Our receiver is operating.
Use drop message
Need mechanical help or parts—Long delay.
Pick us up—Plane abandoned.
Affirmative (Yes)
Negative (No)
(BACK)

239.334.1

Figure 8-4.—Code card, ground/air emergency (back).

Nylon Cord

Nylon cord can be used to construct fish nets, snares, secure spring traps, tie down a windbreak, construct a bow or sling, repair clothes, construct a ladder, and as a fishing line. Nylon cord is provided in 50-foot lengths and has a breaking strength of 100 pounds.

Pocket Compass

The magnetic card type compass is encased in a cylindrical transparent plastic cover with a reference line inscribed on the top of the case. A circular card swings on a jeweled bearing, while a centered pivot supports and suspends the card in its free movement.

To cage the compass and protect the jeweled bearing, it is stored in an inverted position. The compass is reasonably shockproof, but it should be handled with care if one is to expect reliable readings. Damage to the case could impair its waterproof qualities and promote corrosion in spite of its internal corrosion-resistant construction. Fittings outside of the base adapt the compass for wrist wear. One compass is provided for each raft and is stowed in the supply pocket.

The magnetic compass is primarily used for navigating purposes. A compass can also be used to locate iron-base stones (lodestones). Iron-base stones and flint, quartz, or some type of sandstone can be used to strike a fire.

Code Card

The ground/air emergency code card, shown in figure 8-4 (front and back) contains aircraft distress signals, aircraft acknowledgment signals, liferaft paulin signals, and body signals. These signals should be used when communications equipment is not operable, when no communications equipment is available, or when radio silence is required.

First Aid Kit

The first aid kit contains various medical supplies to prevent diseases or to aid injured or sick personnel. First aid kits or medical supplies may be included as part of a survival kit. The kits are stored in the accessory container.

Pocket Knife

The pocket knife consists of one large blade, a combination screwdriver and bottle opener, and one can opener. The pocket knife is a general purpose survival tool. It can be used to cut wood or material, open cans, prepare food, and as a weapon. When in a raft, one should never let the opened knife dangle from its lanyard or lie on the bottom of the raft.

Signal Lights

Distress signal lights are used to attract the attention of SAR aircraft, ships, or ground rescue parties. The SDU-5/E (strobe light) emits a high intensity flashing light visible for great distances. The 761-A (Matrix light) emits a steady light that is beamed, by a special lens, at the horizon, 45° and straight up. It can also be used as a flashlight.

Sunburn Ointment

Sunburn ointment should be applied before exposure to the sun. For most effective results, rub the ointment well into the skin. The ointment can be used in this same way to give protection from windburn in cold areas.

Paulin Life Saving

The paulin is a piece of rubber-coated, nylon fabric in two sizes dependent upon the raft size. The coated side is nonreflective blue and the other side is bright red. The paulin may be used as a raft cover or signaling device at sea, and as a tent or signaling device on land. Liferaft paulin signals are printed on the GND/AIR emergency code form (see figure 8-4, back side).

Hand Pump

The hand pump is used to inflate liferaft seats, inflatable floors and other compartments not inflated by the liferaft inflation assembly. The pump is also used to top off an inflated raft or maintain inflation of a leaky raft.

Rations

Ration packets contain candy and gum. Rations are not primarily items for subsistence but they do produce energy.

Bailing Sponge

One or more sponges may be included in the liferaft assemblies. They can be used to catch rain water, bail out a raft, for personal hygiene, as fishing bait (a small piece soaked in animal blood), and for other purposes.

Whistle

The whistle is used for attracting attention of a rescue ship or personnel in foggy weather or at night.

SPECIAL WHISTLE INSPECTION.—To inspect the whistle, proceed as follows:

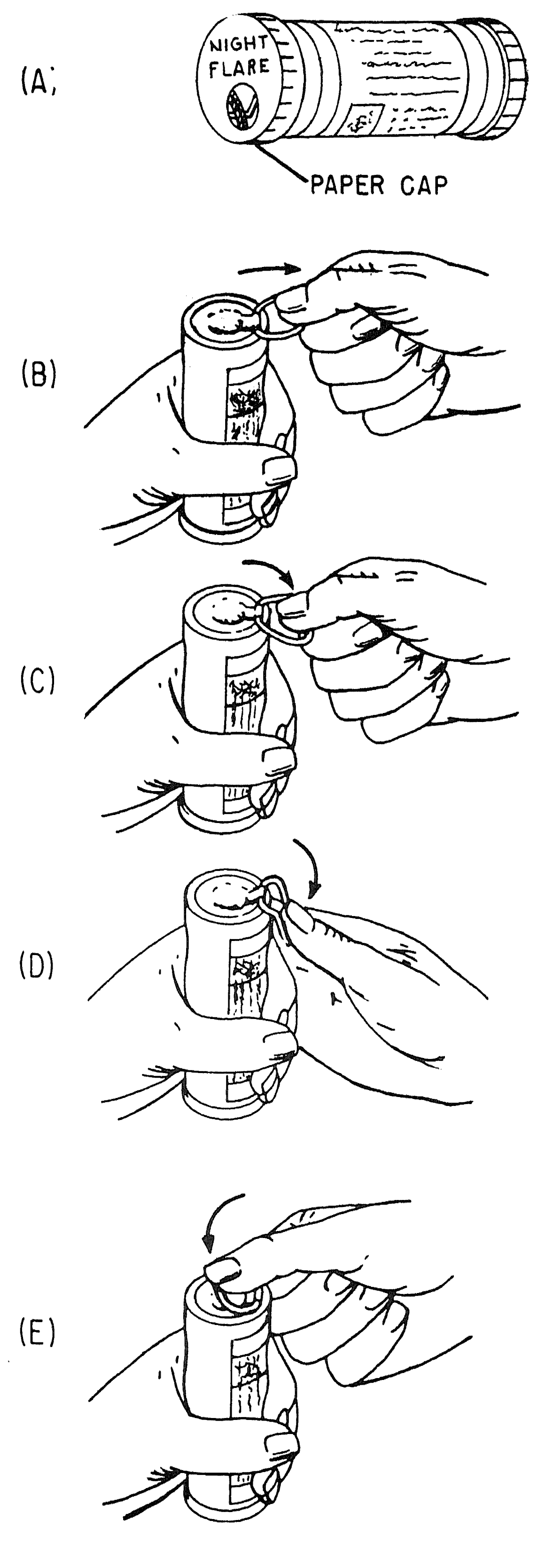
1. Ensure that the whistle side disks are not loose or missing. Inspect the whistle for cracks and damage to the ball. Damaged or defective whistles must be replaced.

2. The whistle should be blown with a normal blow (regular exhalation); it should also be blown with an over blow (forced exhalation). If the whistle fails to emit a highly audible sound, it should be replaced.

Distress Signal Day/Night MK-13 Mod 0

This signal is used to attract the attention of SAR aircraft and to give pickup aircraft the wind drift direction. The night end of the flare produces a red flame and the day end produces an orange smoke. Each end burns for approximately 20 seconds.

The night flare can be identified in the dark by a series of small beadlike projections that are embossed around its circumference. After selecting the flare to be used, the sealing tape should then be torn off from around the end of the cylinder and the paper



239.343

Figure 8-5.—Igniting the MK-13 Mod 0 distress signal.

cap removed. Figure 8-5 illustrates the step-by-step procedures for using the Mk 13 Mod 0 distress signal. Grasp the pull ring and flip it over the rim of the signal case as shown in (B). Press down the over-hanging ring with your thumb until the seal snaps, as shown in (C). If the seal refuses to snap with this kind of force, continue pressing on the ring so that it bends over the rim and against the signal body as shown in (D). Flip the bent ring back to the top of the signal and press down (E), using the bent pull ring as a lever. After the seal breaks, point the signal away from your face and body and give a sharp yank on the pull ring. Hold the signal at an angle of approximately 45 ° from the horizontal with your arm fully extended. Care should be taken not to drop any of the contents on the user or the raft. After one end of the signal has been expended, it may be cooled by immersing in water and then saved until both ends have been used. The distress signal should be cool before being stored.

Desalter Kit

The desalter kit is used to make fresh water from salt water. Each chemical desalting briquet can purify 16 ounces of water.

The desalter kit consists of a hinged metal container with a retaining lanyard, seven or eight wrapped desalting briquets, a length of mending tape, and a plastic bag for processing the water to be desalted. The briquets, processing bag, and mending tape are attached to a nylon tie tape, to each other, and to the metal container. The desalter kits are stowed in the accessory container.

The plastic bag should be rinsed to decrease the taste which passes into the treated water. This is done by filling the bag one-third full of seawater and rubbing the inner surfaces of the bag gently for 2 minutes, then rinsing several times with fresh seawater.

The chemical process is purposely adjusted to leave a little salt in the desalted water to compensate for perspiration losses. If a less salty taste is desired, a smaller amount of water can be used in the bag.

The procedure for using the desalter kit follows:

1. Close valve at the bottom and fill bag to line with seawater.

2. Take out one package of chemical and close container.

3. Remove outer wrapping of briquet, tear off one end of transparent inner wrapping, and pour all of the chemical into the bag of seawater.

4. Fold the top of the bag down tightly, rolling it towards the buckle and strap to make a watertight seal.

5. Permit the chemical to stand in the bag for a few minutes and it will disintegrate.

6. Further pulverize the chemical by kneading it gently for 15 minutes.

7. Shake the bag gently for 30 minutes.

8. To drink the water, unscrew the valve located at the bottom of the bag, being careful not to squeeze the bag. Put the tube in the mouth, and gently squeeze the bag or suck on the tube. Spit out the first few drops if too salty.

9. When finished drinking, close the valve. The remaining water can be left stowed in the bag.

10. When all the water has been drawn from the bag, rinse out the chemical with seawater. The bag is then ready for reuse.

11. In case the bag becomes damaged, dry the affected area carefully and apply a patch of the mending tape provided.

If the plastic bag becomes damaged beyond repair, or is lost, the metal container can be used. In this case, fill the container to the line marked on the inside. Then add one package of the chemical and shake the can gently for 30 minutes. Drink the water through an emergency filter, made by holding a piece of cloth over the top of the can.

Flare Gun MK-79 Mod 0

The illumination signal kit MK-79 Mod 0 is a hand-held signal flare gun used for day and night signaling to attract the attention of SAR aircraft or ground rescue parties. Each kit consists of seven MK-80-1 screw-in cartridge flares and one MK-31 pencil type launcher.

The signal launcher projects a 12,000-candlepower red star 200 feet or above. Each cartridge flare has a minimum duration of 4 1/2 seconds.

OPERATING INSTRUCTIONS.—Operating instructions for the MK-79 Mod 0 signal flare are as follows:

1. Pull the trigger screw into the angular safety slot. This is the position that the launcher is stored in while in service.

2. Mate the launcher with the screw-in flare.

3. Hold the launcher with your arm fully extended overhead.

4. Grip the launcher firmly. With a snapping thumb action, pull the trigger from the safety slot which releases it into the firing slot.

5. If the cartridge misfires, at least one more attempt should be made to fire the signal.

Radios and Beacons

Survival radios and beacons are used for different purposes. The radio is used to establish two-way communications, on one or more channels, between aircrewmen and rescue personnel. The beacon is used to transmit only a swept-tone beacon signal. Radios and beacons are sometimes combined into one system. Beacons are automatically activated by various means.

All survival items, including radios and beacons, must be periodically inspected. In general, the inspection consists of updating the configurations, inspecting for damage, excessive wear, corrosion, expended contents, expiration of service life and operational performance.

Survival items are inspected upon issue and thereafter at intervals which coincide with the inspection schedule of the kit or assembly in which the item is used.

With few exceptions, maintenance of survival items is restricted to replacement of the item that fails to pass the inspection.

LRU-13/A LIFERAFT ASSEMBLY

The LRU-13/A liferaft assembly consists of an inflation assembly (carbon dioxide cylinder and inflation valve) and a seven-man raft. Two types of carbon dioxide cylinders and four types of inflation valves are approved for service use. The liferaft is made up of a two-compartment main tube; an inflatable seat attached to the main tube; a noninflatable floor attached to the bottom of the main tube and inflatable seat; and a sea anchor which is used to retard drifting. A lifeline, a righting line, a supply pocket, and a combination supply bag and bailer are attached to the main tube. Boarding and righting handles are attached to the main tube and the floor. Emergency survival equipment and raft accessories are stowed in the accessory containers. The lifeline also provides a means for securing the accessory containers to the liferaft. Topping-off valves are located on the main tube and the main seat. The LRU-13/A liferaft assembly and parts nomenclature are the same as the LRU-12/A (shown in figure 8-2), except that the LRU-13/A is longer.

EQUIPMENT AND SURVIVAL ITEMS

The LRU-13/A liferaft equipment and survival item requirements and the applicable storage container are listed in table 8-5.

PACKING PROCEDURES REMOTE OR LOCAL PULL

Prior to packing the LRU-13/A liferaft assembly, it must be updated by comparing the configuration of the assembly with the modifications listed in NAVAIR 13-1-6.1.

The LRU-13/A liferaft assembly may be packed for droppable inflation, or for installation into the aircraft nacelle or raft compartment. The method used for packing depends upon the aircraft application.

NOTE: The inflation cable housing must not be inserted through the abrasion patch sleeve when folding and packing the raft. The cable housing should be inserted into the sleeve after the raft is inflated.

Here are the packing procedures for the LRU-13/A liferaft assembly. These packing procedures apply to all methods of packing unless a specific method for either the droppable or local mode of inflation is specified in parentheses.

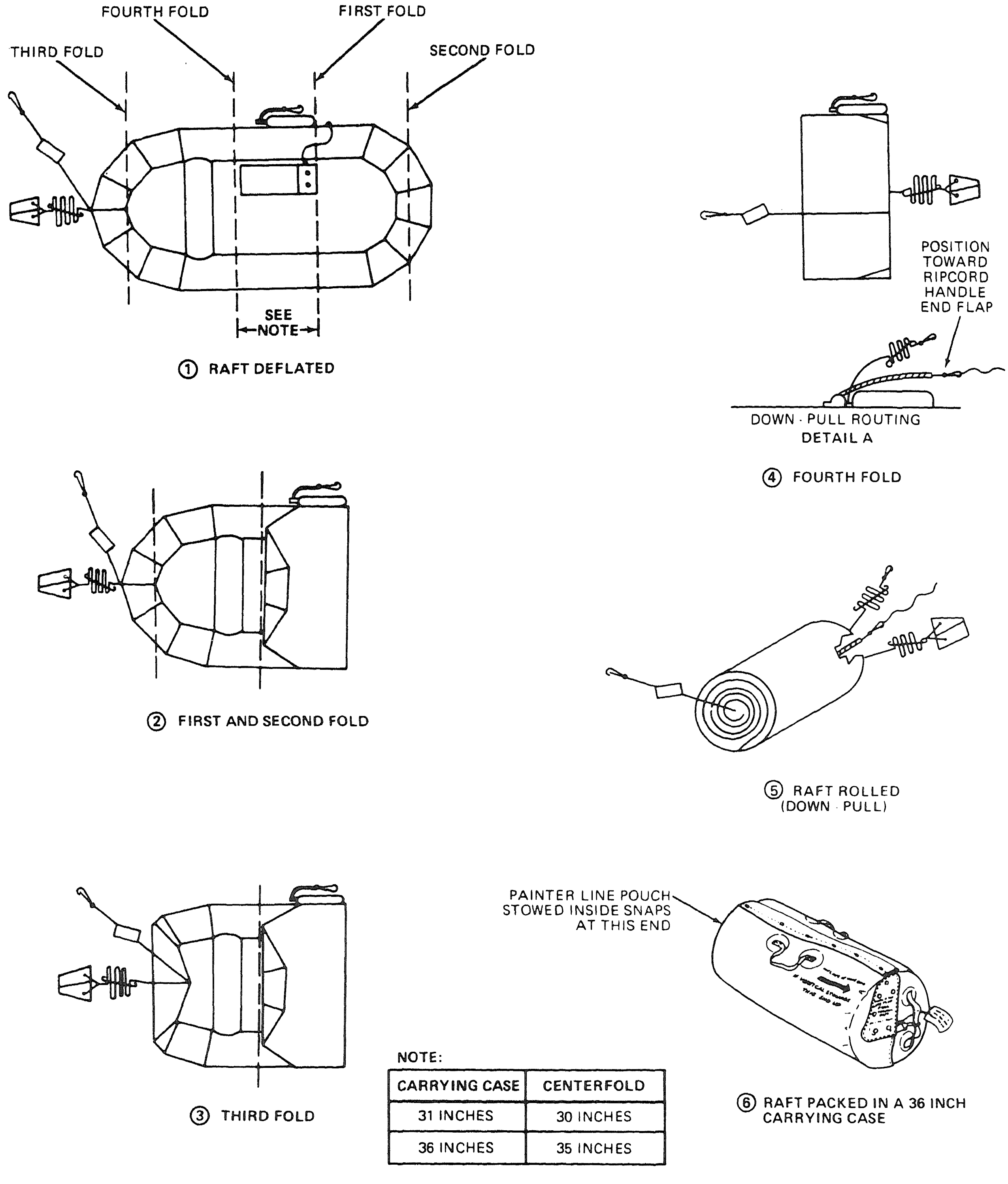
1. Ensure that the raft, carrying case, and accessory container have been inspected.

2. Ensure that the survival items and raft accessories have been inspected for expiration and damage. Refer to table 8-5 for items used.

3. Wrap all sharp or pointed metallic accessories and survival items with rubber-coated cloth, and secure the objects with rubber bands. Stow the accessories and survival items in the accessory container, or the supplies and bailer pocket, as applicable.

4. Cover the inflation valve with several layers of rubber-coated cloth, and secure it with cloth-based, pressure-sensitive tape. Take the webbing retaining line, righting line, and sea anchor mooring line, and secure them with rubber bands. Ensure that all of the topping-off valves are closed and raft is completely deflated.

5. Using a 10-foot length of type III nylon cord, tie the accessory equipment container to the nearest lifeline loop located next to the CO_2 cylinder and stow the container inside the raft.


FOURTH FOLD
FIRST FOLD
THIRD FOLD
SECOND FOLD
SEE NOTE
① RAFT DEFLATED
POSITION TOWARD RIPCORD HANDLE END FLAP
DOWN - PULL ROUTING
DETAIL A
④ FOURTH FOLD
② FIRST AND SECOND FOLD
⑤ RAFT ROLLED (DOWN - PULL)
PAINTER LINE POUCH STOWED INSIDE SNAPS AT THIS END
③ THIRD FOLD
⑥ RAFT PACKED IN A 36 INCH CARRYING CASE

NOTE:

CARRYING CASE	CENTERFOLD
31 INCHES	30 INCHES
36 INCHES	35 INCHES

239.345.1

Figure 8-6.—LRU-13/A raft-folding procedures (droppable).

6. (Fold the raft in accordance with figure 8-6, for droppable inflation).

7. Insert the folded raft into the carrying case so that the actuating handle or pull cable housing is positioned under the carrying case end flap.

8. Secure the carrying case snap fasteners.

NOTE: If the actuator case snap hook is not soldered, wrap tape around the hook to prevent possible loss of the spring latch.

9. Rig the pull cable housing to the carrying case ripcord.

10. (Install the ripcord and safety tie the first and last ripcord pins by passing a 12-inch length of size E nylon thread under the ripcord pin). Secure the thread to the ripcord cable with three or four half-hitches (figure 8-7).

NOTE: Rafts stowed inboard on aircraft are secured to the aircraft with a painter line. The painter line is a 60-foot length of cotton cord (unless otherwise specified by the applicable aircraft MIM), type I, size 4 with a 50- to 150-pound static breaking strength.

The painter line retains the deployed raft to the aircraft but will easily break if the aircraft sinks. The painter line is attached to the sea anchor mooring patch loop unless otherwise specified by the applicable aircraft MIM. Stow the painter in the painter line pouch and place the pouch under the packed raft if possible.

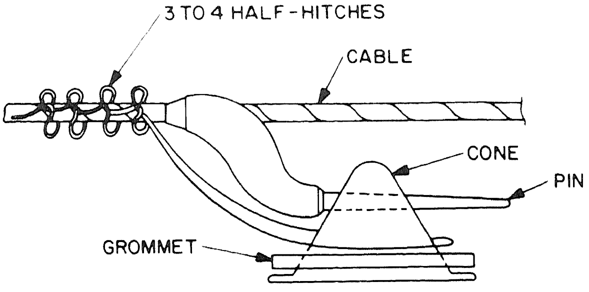


Figure 8-7.—Safety tying ripcord.

11. (Snap the ripcord protector flap closed, position the ripcord handle under the carrying case end flap, and snap the end flap closed).

12. (Ensure that the inflation valve actuating handle is positioned outside the carrying case end flap, and snap the end flap closed).

When the LRU-13/A liferaft assembly is packed for installation into the aircraft nacelle or raft compartment, follow procedures outlined in the applicable aircraft MIM.

All LRU-13/A liferaft assemblies installed in C-1A aircraft must be packed for down-pull inflation using the "snap hook" remote actuator assembly consisting of a snap hook pull cable assembly and a pull cable housing assembly. In no instance are "ice-tong" remote actuator assemblies to be used in C-1A aircraft.

LRU-14/A LIFERAFT ASSEMBLY

The LRU-14/A liferaft assembly consists of an inflation assembly (carbon dioxide cylinder and inflation valve) and a 12-man raft. Two types of carbon dioxide cylinders and four types of inflation valves are approved for service use.

The liferaft is made up of a two-compartment main tube; a smaller single-compartment upper tube permanently attached to the top of the main tube; an inflatable seat attached to the main tube; a noninflatable floor attached to the bottom of the main tube and seat; a two-section inflatable floor tied to the inside of the noninflatable floor; and a sea anchor which is used to retard drifting.

A lifeline and a supply pocket are attached to the main tube. Boarding and righting handles are attached to the main tube and both floors. Survival equipment and raft accessories, stowed in the accessory container, provide for the safety and survival of the aircrewmen. The lifeline also provides a means for securing the accessory containers to the raft. Topping-off valves are located on the upper tube, inflatable seat, and on both sections of the inflatable floor.

The LRU-14/A liferaft assembly parts nomenclature is shown in figure 8-8.

EQUIPMENT AND SURVIVAL ITEMS

CNO has established survival equipment lists as standards for all concerned. These lists provide sufficient equipment and items for 24-hour survival.

The LRU-14/A liferaft equipment and survival item requirements and the applicable storage container are listed in table 8-5.

NOTE: To make up the packaged liferaft assembly complete with accessories and survival items, all required components not supplied with the raft assembly must be individually requisitioned.

OPERATION

The LRU-14/A liferaft assembly is inflated by pulling the inflation assembly actuating handle, located under the carrying case end flap. The inflation assembly inflates the main tube only. After the survivor boards the raft, the upper tube, seat, and floor sections should be inflated through the topping off valves, with the hand pump provided in the accessory container.

The LRU-14/A liferaft assembly can either be dropped to survivors or used by aircrewmen in the event of an emergency. The raft is stowed either in a readily accessible area inside the aircraft fuselage or in an aircraft compartment designed for rafts.

Prior to packing, the LRU-14/A liferaft assembly should be updated with the modifications listed in NAVAIR 13-1-6.1.

The LRU-14/A liferaft assembly may be packed for droppable or aircraft installation. The method used depends upon aircraft application (see figure 8-9).

LRU-15/A LIFERAFT ASSEMBLY

The LRU-15/A liferaft assembly consists of an inflation assembly (carbon dioxide cylinder, inflation valve, and cover) and a 20-man liferaft. Two types of carbon dioxide cylinders and four types of inflation valves are approved for service use.

The liferaft is made up of two single-compartment circular tubes connected by an equalizer tube; a noninflatable floor suspended between the circular tubes; and a boarding ramp permanently attached to each circular tube. The floor is equipped with a built-in inflatable floor support and the inflatable boarding ramps are located on opposite sides of the raft.

A sea anchor, used to retard drifting, is stowed in the sea anchor pocket which is located at the junction of the circular tubes. An inner lifeline, boarding handles, a heaving line, and emergency survival equipment, stowed in the accessory container, are provided for the safety and survival of the aircrewmen. The inner lifeline, attached to the floor, and the boarding handles, attached to the circular tubes and boarding ramps, are used to secure the accessory container to the raft. Topping-off valves are located on each side of the tubes. A topping-off valve is also located on each side of the floor support. The LRU-15/A liferaft assembly parts and nomenclature are shown in figure 8-10.

EQUIPMENT AND SURVIVAL ITEMS

The LRU-15/A liferaft equipment and survival item requirements and the applicable storage container are listed in table 8-5.

The LRU-15/A liferaft assembly (droppable) is inflated by pulling the inflation assembly handle, located under the carrying case end flap.

The LRU-15/A liferaft assembly (wing installation) is automatically inflated and ejected from the raft compartment after the liferaft compartment door has been released. A unique design feature of the LRU-15/A is that it is always right side up after inflation. The inflation assembly inflates the circular tubes and boarding ramps only. In the event that the inflation assembly does not function properly, the equalizer tube distributes gas equally between each circular tube. After boarding, the floor support is inflated with the hand pump provided in the accessory container. The circular tubes may be topped off, if necessary, from either side of the raft floor.

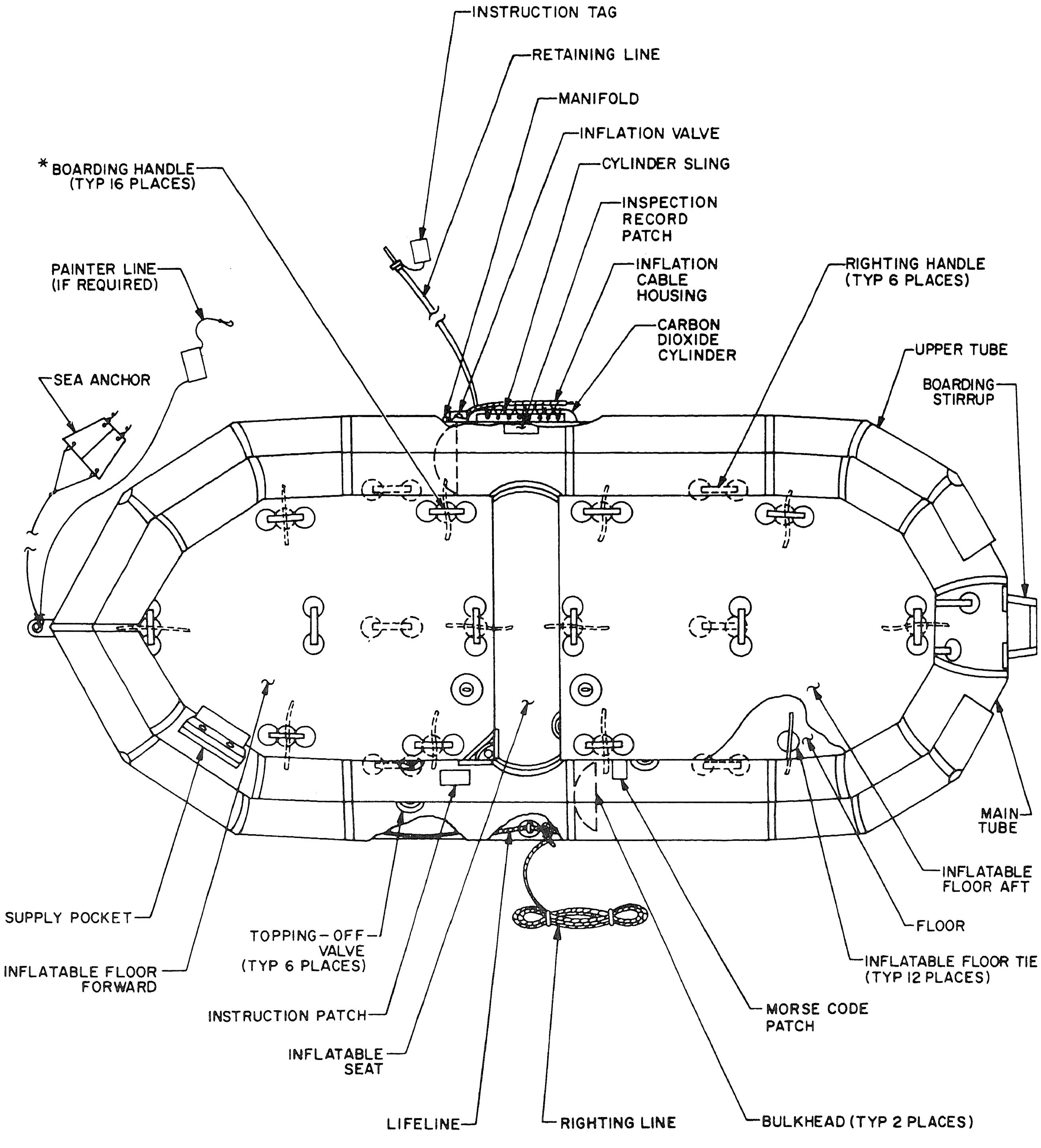


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Figure 8-8.—LRU-14/A liferaft assembly, parts nomenclature.

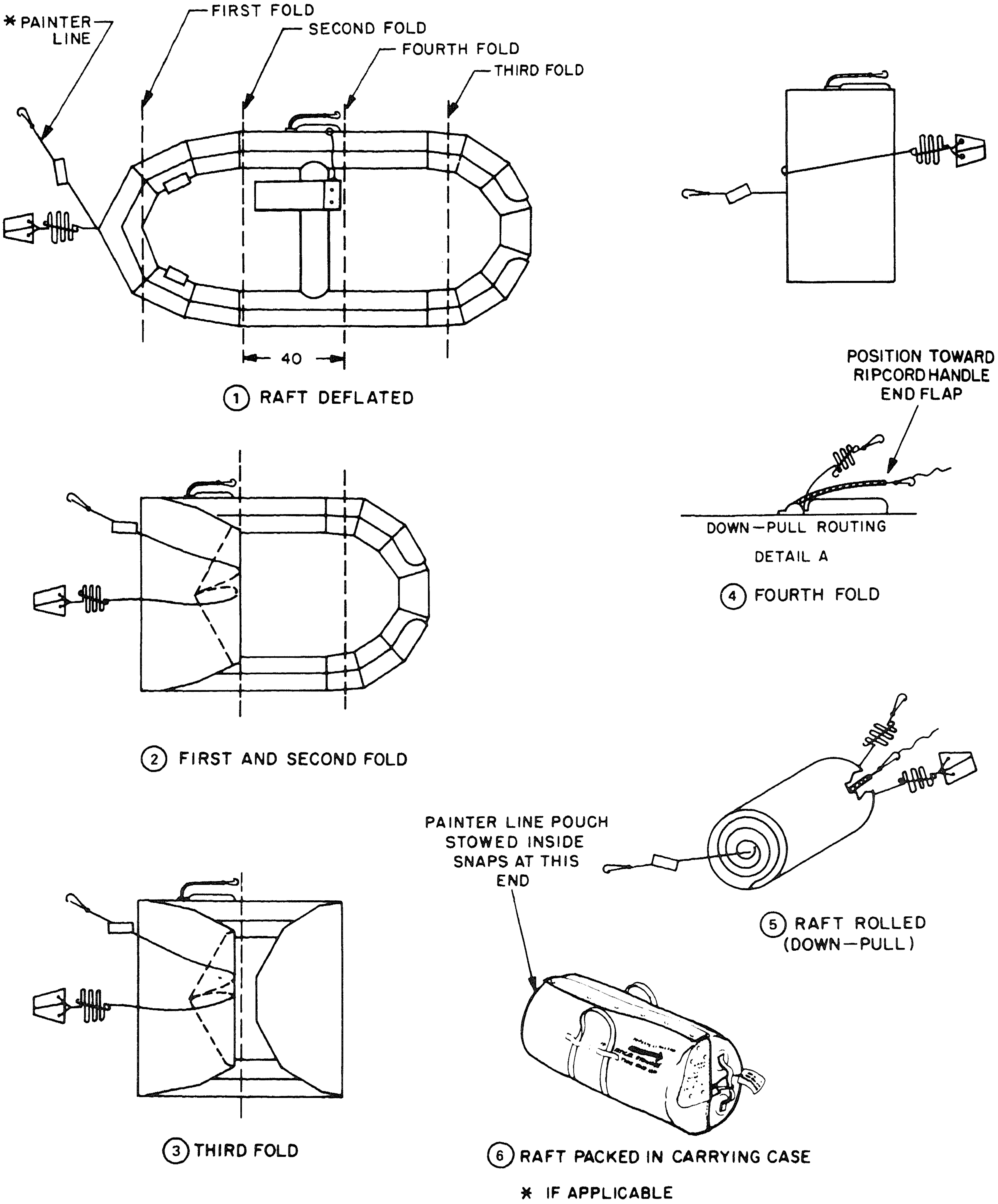
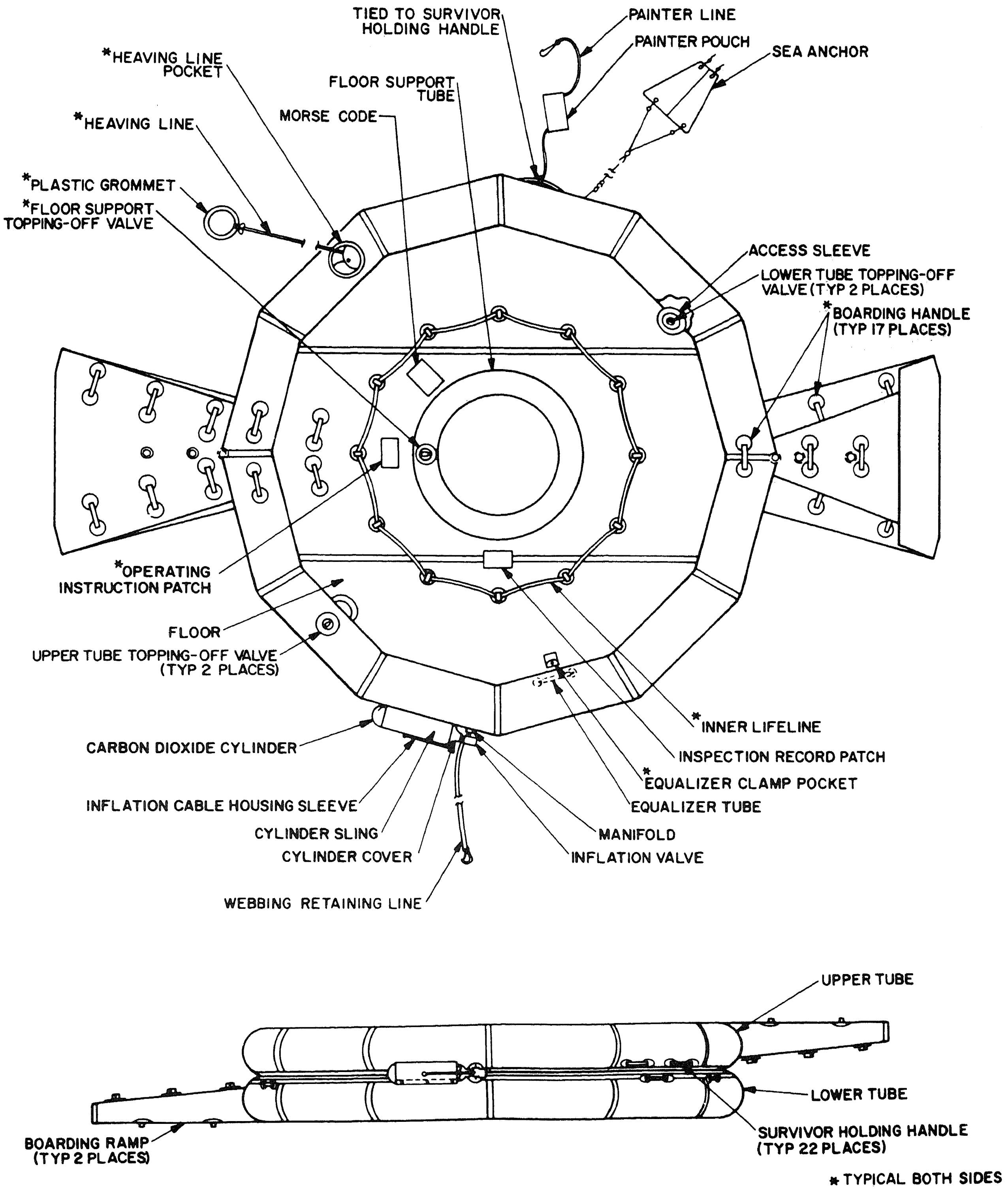


Figure 8-9.—LRU-14/A liferaft-folding procedure, remote pull. 239.345



239.347

Figure 8-10.—LRU-15/A liferaft assembly, parts nomenclature.

The LRU-15/A liferaft assembly can be either dropped to survivors or used by aircrewmen in the event of an emergency. Each type of packaged LRU-15/A liferaft assembly is used in certain types of aircraft; for applicable configurations, refer to the aircraft MIM.

Prior to packing the LRU-15/A liferaft assembly, it must be updated by comparing the configuration of the assembly with the modifications listed in NAVAIR 13-1-6.1.

EMERGENCY REPAIRS

Emergency repair of the LRU-15/A raft, when in the water, is accomplished by the use of the metal clamp type plugs provided in the accessory equipment container of each raft. No emergency repair equipment is provided with other types of rafts.

SAFETY PRECAUTIONS

Cements and solvents are flammable materials and must be treated as such. Never smoke nor permit any type of open flame near cements or solvents when they are being used. After completion of any repair work involving these materials, always replace caps or covers as tightly as possible. The container should be stored in a cool storeroom. Common sense and a few precautions help to avoid accidents. WHEN WORKING WITH CEMENTS AND SOLVENTS, DO SO IN A WELL-VENTILATED SPACE.

STOWAGE OF RAFTS

Pneumatic survival equipment of any kind should never be stowed near hot places, batteries, auxiliary powerplant, stoves, inverters, or the like. Frequent inspection and occasional discipline is also necessary in order to detect and stop pilferage of the contents of stowed rafts. Nonflying squadron personnel must be made aware of the dangers which may result from pilferage.

Rafts carried in aircraft not equipped with raft compartments should be stowed in the fuselage in a manner and position that renders them readily available. This saves much valuable time for personnel in abandoning the aircraft during a ditching. Rafts stowed in the fuselage should retain their carrying cases.

Because of the nature of materials used in raft construction, both flight and maintenance personnel should avoid sitting on rafts or placing heavy tools or other equipment on them.

DEMONSTRATING THE USE OF RAFTS

Many ditching and water crashes occur in a rough sea or at night. Only complete familiarization with the use of survival equipment will give the aircrewman a chance of survival under such adverse conditions. Therefore, intensive drill in the use of rafts and their associated equipment is essential for safety.

The survival officer must be concerned with survival techniques and should see that a survival training program is set up in the parachute loft. In most cases, the chief-in-charge of the loft has the responsibility of setting up this training. As a PR3 or PR2 you will have many occasions to participate in this training and, in many instances, may be completely responsible for the carrying out of the program. Regardless of who is in charge and must shoulder the complete responsibility, it is the duty of every PR to be completely familiar with all phases of survival training and to be able to demonstrate the use of survival equipment.

A very effective system of training in water survival techniques is the use of the Dilbert Dunker to simulate an actual aircraft ditching as closely as possible and to teach the best escape procedure with full equipment.

Although such complete courses of training cannot be conducted in certain localities because of the lack of specialized equipment, the PR should make every attempt to give aircrewmen frequent practice in the actual use of the equipment. Discussions, demonstrations, and shop lectures are all helpful, but working with the actual raft equipment is the only way to acquire the knowledge essential to survival.

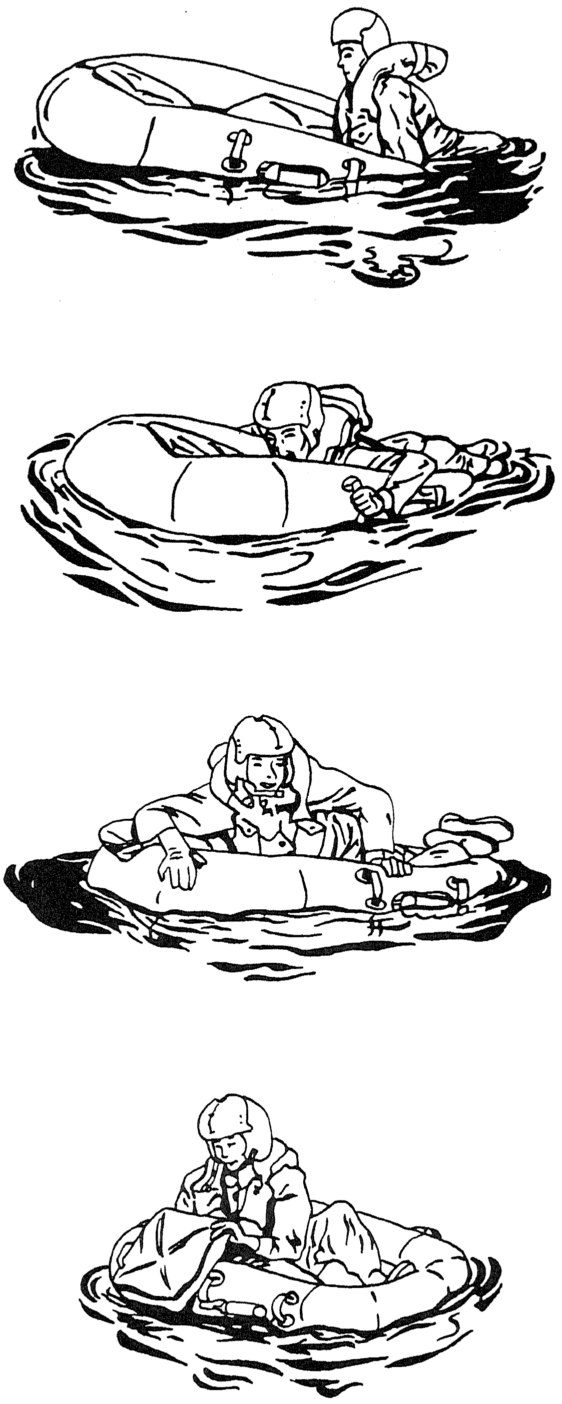


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Figure 8-11.—Boarding the LR-1 raft.

In demonstrating the raft's use, the most important thing to stress is that the retainer lanyard snap is firmly attached to the ring on the lifevest before inflating the raft. Inflate the raft as soon as possible so that personnel can get out of the water. Inflation of the raft is done by pulling on the short length cable attached to the CO_2 cylinder valve. After several hours, the CO_2 cylinder may be removed from the side of the raft. It tends to chafe the side of the compartment and acts as an anchor, causing the raft to orbit around it. Sometimes it is possible to back off the coupling between the cylinder and the manifold so that the cylinder releases from the mount. Once the cylinder has been removed, it is no longer useful in any way and should be thrown over the side. This, of course, is under actual emergency conditions; in a training demonstration, the cylinder should be saved and recharged for further use on the training equipment.

In demonstrating their use, also give instructions on manual inflation of rafts. If nothing happens after the CO_2 cable has been pulled, the carrying case should be pulled off and the raft unfolded so that the hand pump will be accessible. After the pump is removed, the first compartment to be inflated should be the seat. This will help keep the raft afloat so that the remaining compartment can be inflated with the pump. In attaching the pump, care must be taken not to screw the pump too tightly to the valve. If it is too tight, it may freeze and be impossible to loosen without some type of wrench or pliers.

BOARDING THE RAFT

The best method for boarding the multiplace liferaft is to use the boarding stirrup located on the stern of the LRU-12/A, -13/A, and -14/A. This stirrup will allow the aircrewman to board the raft from the stern; boarding from the stern will lessen the possibility of capsizing the raft.

Figure 8-11 shows the proper method used to board the LR-1 liferaft.

If the raft should capsize, it is best to approach it from the side on which the CO_2 cylinder is installed. The survivor reaches across the raft and grasps the righting handle farthest from the cylinder. Then, by sliding back into the water and pulling on the righting handle at the same time,

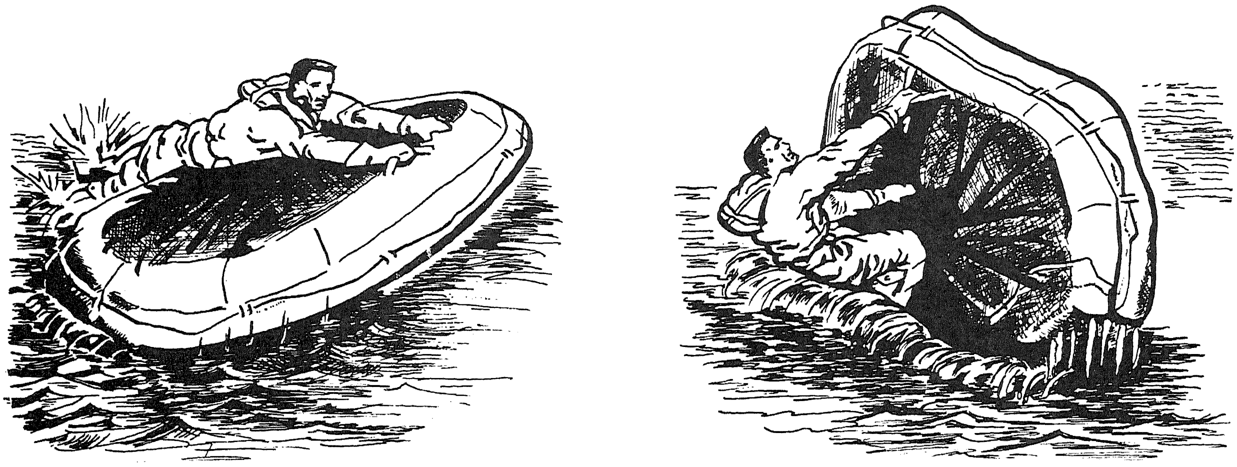

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Figure 8-12.—Righting a capsized raft.

the raft will turn right side up. By this method, there will be no chance of the CO_2 cylinder hitting the survivor when he rights the raft. (See figure 8-12.)

Another important point to remember in righting the raft is to note the wind and take advantage of it. It is very hard to right a raft against the wind.

SAFETY PRECAUTIONS IN BOARDING RAFTS

Extreme care should be taken when boarding rafts or assisting personnel into the raft from the water. This is particularly so if these persons are wearing parachute harness or lifevests. Once in a raft, all personnel should seat themselves on the floor and remain in that position if at all possible. Movement within the raft should be restricted as much as possible to keep friction at a minimum. All sharp objects should be collected and stored, especially jeweled rings, wristwatches, etc. All loose articles of equipment should be properly packaged to protect the raft fabric.

ONE-MAN LIFERAFT (LR-1)

The LR-1 liferaft assembly supersedes and replaces all PK and PR series one-man liferafts. All PK and PR liferafts currently in use must be modified in accordance with the instructions contained in NAVAIR 13-1-6.1.

LR-1 LIFERAFT ASSEMBLY

The LR-1 liferaft assembly consists of an inflation assembly (carbon dioxide cylinder and inflation valve), and a one-man liferaft; three types of carbon dioxide cylinders and three types of inflation valves are approved for service use.

The raft consists of a single-compartment flotation tube with a noninflatable floor. It is blue (when initially procured) and features a weathershield, sea anchor, sea anchor pocket, and a retaining line pocket. The weathershield is a dull sea-blue on the outside and a bright red on the inside. In addition, a directive compliance patch and an inspection record patch are included for record keeping. The various applications of the LR-1 liferaft are contained in NAVAIR 13-1-6.1.

Emergency survival equipment (when used) is secured to the raft by either a securing line or a drop line, as applicable. The packaged configuration of an LR-1 liferaft assembly, including survival items, varies according to application.

To make up a packaged assembly, the required components must be individually requisitioned, unless otherwise specified.

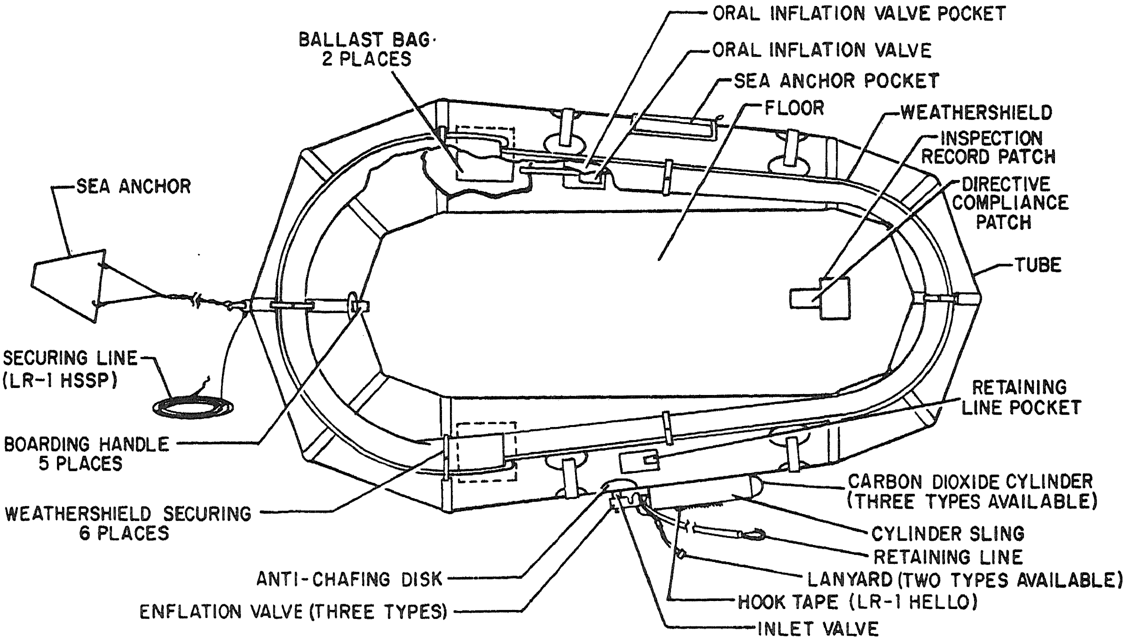

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Figure 8-13.—LR-1 liferaft assembly.

The LR-1 liferaft assembly is inflated either manually by pulling the inflation assembly actuating lanyard, or automatically on the LR-1 (RSSK) by gravity drop on the kit actuation. The inflation assembly inflates the flotation tube. After boarding the raft, you can top off the LR-1 by using the oral inflation valve.

This section describes the components of the LR-1, the survival equipment, and the procedures for performing inspections and maintenance. We will not repeat procedures which parallel those already outlined for multiplace rafts.

FLOTATION TUBE

The body of the raft consists of an encircling tube which is one continuous chamber. There are no internal bulkheads as in the multiplace rafts. Various attachments to the flotation tube are shown in figure 8-13.

ORAL INFLATION TUBE

The valve on the oral inflation tube closes automatically by spring pressure when it is not held open. The valve is locked shut by turning the mouthpiece in a clockwise direction. The 3/8-inch oral inflation tube is cemented to the valve at one end, and at the other end it has a molded flange which is cemented to the flotation tube.

BOARDING HANDLES

Five handles are provided as aids for boarding the raft.

BALLAST BAGS

Ballast bags, installed at two locations, are required to increase the raft stability, to prevent the raft from becoming airborne during helicopter pickup, and to aid in boarding the raft.

WEATHERSHIELD

The weathershield is used to protect the survivor from adverse weather.

SEA ANCHOR

The sea anchor is used to keep the inflated raft from drifting. The sea anchor is tied to the raft mooring line with type III nylon line, using a bowline knot; the other end is tied to the sea anchor mooring patch with a bowline knot. The bitter ends of both knots are seared and completed with an overhand knot to prevent them from untying. Before tying the knots, the ends of the nylon line are heat fused to prevent fraying.

SEA ANCHOR POCKET

The purpose of the sea anchor pocket is to prevent survivors from getting tangled up in the sea anchor line while boarding the raft. Downed aircrewmen should remove the sea anchor from the pocket and cast the anchor adrift immediately after boarding the raft.

SECURING LINE

The securing line is 5-feet of nylon cord. It secures the raft to the raft container, to prevent loss of the survival items.

The nylon cord is inserted through the webbing loop on the sea anchor mooring patch and secured with a bowline knot followed by an overhand knot. The free end is secured to the raft container during the raft packing.

RETAINING LINE

A nylon webbing retaining line 1 inch wide and 6 1/2 feet long is used to secure the raft to the user. One end of the retaining line is equipped with a snaphook. The other end is secured to the CO_2 cylinder neck by passing the end of the retaining line with the loop formed in it around the coupling nut between the raft and the inflation assembly. The end of the line containing the snaphook is then passed through the loop and pulled up tight.

SURVIVAL ITEMS

The LR-1 packaged assemblies requiring survival items are equipped with the items listed in table 8-6. These items are packed in either the combination carrying case and equipment container or in the equipment container, as applicable. The remaining space in the container may be used for any specialized equipment for specific environmental or geographic conditions, as directed by the Area Commander.

You should refer to NAVAIR 13-1-6.1 for information concerning which type of packaged LR-1 liferaft assembly is used aboard certain types of aircraft.

Table 8-6.—LR-1 liferaft survival items

Description	Quantity Required
Dye Marker	2
Distress Signal MK 13 Mod O	2
Emergency Radio Beacon AN/URT-33	1
Battery Power Supply	1
Water, Drinking, Canned, Emergency	1 ①
Opener, Can, Hand	1
Cord, Nylon, Utility, 50 feet	1
SRU-31/P Individual Survival Kit (Part 1—Medical, Part 2—General)	1
Ground Air Emergency Code Manual	1
Combat Casualty Blanket Type II 3 oz.	1
Bailing Sponge	1
Personnel Lowering Device	1

① optional item

INSPECTION

During the liferaft inspection phase and prior to starting any packing procedures, the liferaft must be updated and modifications incorporated if required. Compare the liferaft assembly configuration with the applicable type raft modifications listed in NAVAIR 13-1-6.1.

All pararaft assemblies get a calendar inspection upon issue and at intervals which coincide with the aircraft inspection cycle. However, the interval between calendar inspections must not exceed 225 days.

The procedure for inspecting and testing the pararaft is generally the same as those given earlier in this chapter for the multiplace liferaft. Additionally, you should read NAVAIR 13-1-6.1. Where there are considerable differences in raft construction, certain steps may be eliminated or added as necessary. For example, pararafts are not constructed with internal bulkheads. Since there is only one continuous flotation tube, the internal bulkhead test is not necessary on the pararaft. The pararaft is fitted with an oral inflation tube, but it serves the same purpose as the multiplace raft topping-off valves. Therefore, the same general considerations given the topping-off valve should be applied to the oral inflation tube. For instance, although the exposed end of the oral inflation tube has no rough edges, it is kept in a supporting pocket.

CHAPTER 9

LIFE PRESERVERS

LIFE PRESERVERS are worn by Naval personnel on overwater flights and are to be used in emergencies. Their function is to keep you afloat until a raft can be reached or until a rescue team arrives. Proper inspection, maintenance, and handling of these preservers are necessary to prevent any possible malfunction that could result in the loss of life.

Pneumatic life preservers are safe, comfortable, and easy to wear. They provide sufficient buoyancy to support you if you bail out or ditch into water. These preservers are rapidly inflated with a compressed CO_2 cartridge. They also have an auxiliary oral inflation device. Accessory survival items may or may not be attached, depending upon the type of preserver.

Whoever uses the life preserver must be familiar with its donning, fitting, care, and operation. If an overwater emergency arises that requires ejection or ditching, the aircrewman should be aware that spending several minutes or several days in the water is a good possibility. An inflated preserver will possibly assist him in reaching the raft safely. Once the survivor is aboard the raft, the preserver should be kept on and inflated in case the raft capsizes or is deflated.

LPA-2 SERIES LIFE PRESERVER ASSEMBLY

DESCRIPTION

The LPA-2 series life preserver assembly is authorized for use by all aircrew personnel wearing compatible flight clothing. It is designed as a constant wear item for use with the survival vest and does not interfere with the removal of the nonintegrated parachute harness. Survival item pouches are attached to the life preserver casing. The dye marker and signal flares that go into these pouches are not initially supplied and must be individually requisitioned.

Modifications to the LPA-2 life preserver have resulted in new letter designations being assigned to the preserver. For the sake of clarity, the term "LPA-2 series" is used here where appropriate.

NOTE

> Presently the LPA-2 and LPA-2A Life Preserver Assemblies use pull toggles for actuation. After incorporating Aircrew System Change 405, which directs installation of beaded inflation handles, the LPA-2 and LPA-2A life preservers become the LPA-2B. The beaded inflation handles added by this change improve toggle accessibility and provide the inflation system with a multidirectional pull capability. (The recommended direction of pull, however, is straight out from the body.)

The LPA-2 series life preserver assembly weighs 4 pounds (without survival items) and provides at least 65 pounds of buoyancy. The flotation assembly is constructed of polychloroprene-coated nylon cloth and consists of two independent flotation chambers. One chamber consists of the left waist lobe joined by a tube to the right collar lobe. This chamber is serviced by the carbon dioxide inflation assembly and oral inflation valve attached to the left waist lobe. The other chamber consists of the right waist lobe joined by a tube to the left collar lobe. This chamber is serviced by the carbon dioxide inflation assembly and oral inflation valve attached to the right waist lobe. The two chambers are sewn together at the collar lobes. See figure 9-1.

Each waist lobe of the flotation assembly is equipped with an attachment patch used for securing the casing assembly by means of rivets. In addition, the right waist lobe is equipped with one snaphook and the left waist lobe is equipped with one D-ring. The snaphook and the D-ring are used to secure the waist lobes together after inflation. Survival item pouches are fastened to the life preserver D-rings with directional snap fasteners.

Each collar lobe of the flotation assembly is equipped with a snaphook for attachment to the survival vest D-rings (parachute risers are routed outside of the collar lobes). In addition, an inspection record patch is also provided on a collar lobe.

Older LPA-2 life preservers have a foam cushion strip (collar pad). New life preservers shall not be reworked to add a cushion strip, and older life preservers shall not be reworked to remove the cushion strip since the strip does not affect the function of the life preserver.

The casing assembly is constructed of rubber-coated nylon cloth and protects the flotation assembly. The casing assembly also provides for size adjustment and attachment to the wearer. The casing assembly consists of the adjustable casing, an adjustable webbing belt, belt keepers and D-rings, and the front connector assembly (figure 9-1).

The webbing belt, attached to the inside waist portion of the casing assembly, provides waist size adjustment from 30 to 44 inches. The webbing belt keeper loops retain the webbing belt and provide attachment of the survival vest about the wearer's waist. In addition, there are six D-rings secured to the webbing belt keeper loops, used for attaching the survival item pouches, a raft retaining line, and other accessories.

Hook and pile tapes, attached to the outside waist portion of the casing, are used for slack adjustment. In addition, hook and pile tapes, attached about the circumference of the collar casing and the lower edge of the back portion of the casing, are used to enclose the casing assembly about the flotation lobes.

The casing assembly is secured around the wearer's waist by the front connector assembly, which consists of two snaphooks and two D-rings backed by webbing pads for comfort.

Each inflation assembly is made up of a carbon dioxide cylinder and an inflation valve. The inflation assemblies are connected to valve stems attached to each waist lobe (each valve stem is equipped with a check valve to prevent leakage) (figure 9-1).

APPLICATION

The LPA-2 series life preserver assembly is authorized for use by all aircrew personnel wearing compatible flight clothing. LPA-2 series life preservers that are modified to incorporate the FLU-8/P series automatic inflation device are used in ejection seat type aircraft only. LPA-2B series life preservers modified with the FLU-8A/P inflator are redesignated LPU-24A/P life preservers. This chapter does not cover the LPU-24/P.

FUNCTION

The LPA-2B is manually inflated by pulling both inflation assembly beaded handles straight out from the body. This action removes the retaining pins securing the casing assembly about the waist lobes and activates the inflation assemblies. The hook and pile tapes securing the casing assembly about the collar lobes will separate as the preserver inflates.

NOTE

The casing must be manually opened and the flotation assembly unfolded prior to inflating a preserver through the oral inflation valve.

In an emergency situation, the oral inflation valves may be used to top-off an inflated preserver, maintain inflation of a leaky preserver, or inflate a chamber if an inflation assembly malfunctions. The oral inflation valves are also used to inflate a preserver with air during an inspection test and to evacuate a preserver in preparation for packing.

The LPA-2B series life preservers are very similar to the LPU-21/P series life preservers. Specific instructions for their maintenance are found in Chapter 13 of NAVAIR 13-1-6.1.

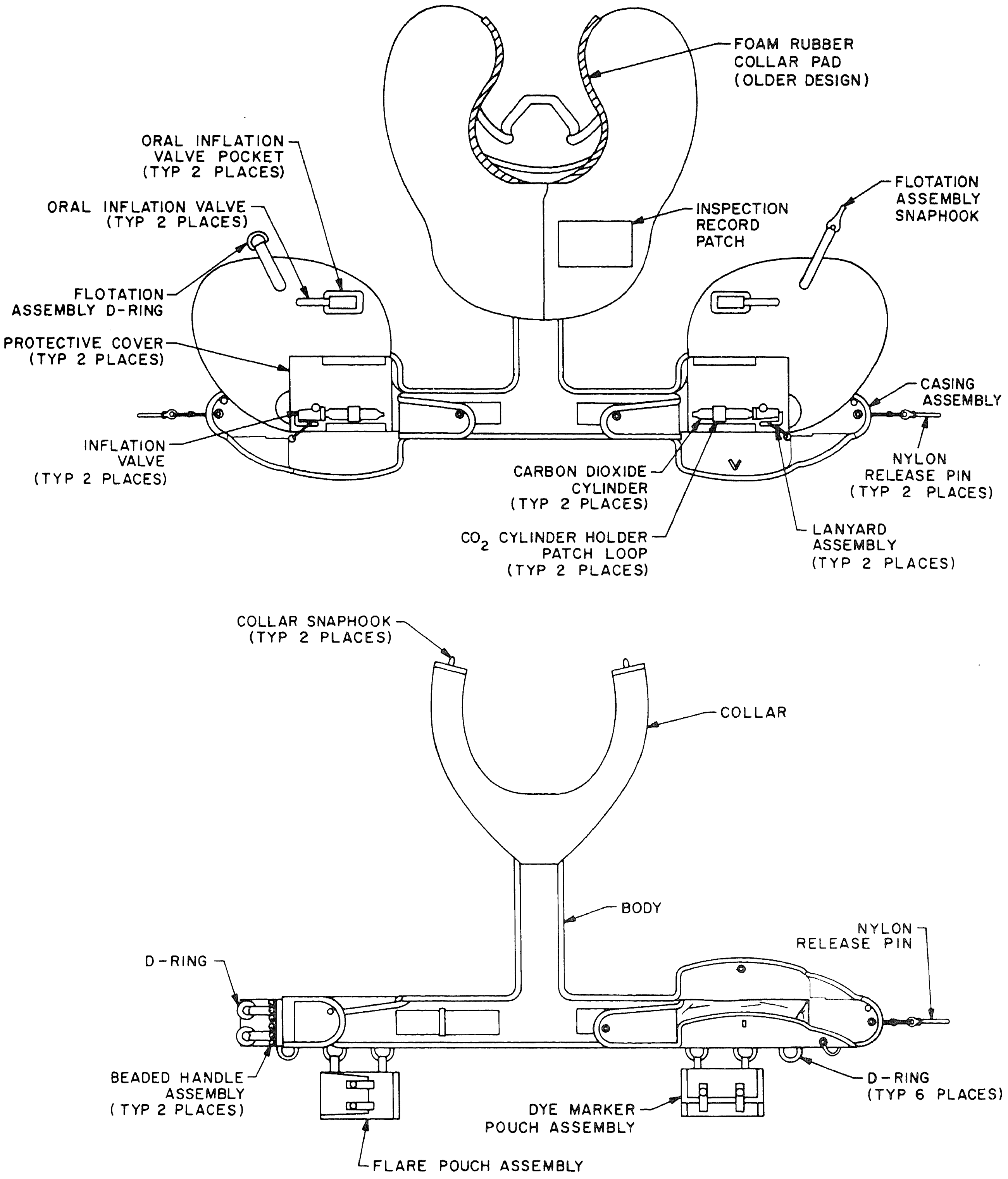
FOAM RUBBER COLLAR PAD (OLDER DESIGN)
ORAL INFLATION VALVE POCKET (TYP 2 PLACES)
ORAL INFLATION VALVE (TYP 2 PLACES)
FLOTATION ASSEMBLY SNAPHOOK
INSPECTION RECORD PATCH
FLOTATION ASSEMBLY D-RING
PROTECTIVE COVER (TYP 2 PLACES)
CASING ASSEMBLY
INFLATION VALVE (TYP 2 PLACES)
NYLON RELEASE PIN (TYP 2 PLACES)
CARBON DIOXIDE CYLINDER (TYP 2 PLACES)
CO_2 CYLINDER HOLDER PATCH LOOP (TYP 2 PLACES)
LANYARD ASSEMBLY (TYP 2 PLACES)
COLLAR SNAPHOOK (TYP 2 PLACES)
COLLAR
BODY
NYLON RELEASE PIN
D-RING
BEADED HANDLE ASSEMBLY (TYP 2 PLACES)
DYE MARKER POUCH ASSEMBLY
D-RING (TYP 6 PLACES)
FLARE POUCH ASSEMBLY

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Figure 9-1.—LPA-2B Life preserver assembly, parts nomenclature.

LPU-21/P SERIES LIFE PRESERVER ASSEMBLY

Like the LPA series, the LPU-21/P series life preserver assembly is authorized for use by all aircrew personnel wearing compatible flight clothing. It is designed as a constant wear item for use with the survival vest and does not interfere with the removal of the nonintegrated parachute harness. Survival item pouches are attached to the life preserver casing. The dye marker and signal flares that go into these pouches are not initially supplied and must be individually requisitioned.

Modifications to the LPU-21/P life preserver have resulted in new letter designations being assigned to the preserver (LPU-21B/P). For the sake of clarity, the term LPU-21/P series is used here where appropriate (refer to figure 9-2).

LPP-1/1A LIFE PRESERVER ASSEMBLY

The LPP-1/1A life preserver assembly is authorized for use by passengers in cargo or transport type aircraft for sea survival situations.

WARNING

The LPP-1/1A life preserver is not suitable for use by small children in Naval aircraft.

The LPP-1 and LPP-1A life preserver assemblies are identical with the exception of the mechanical inflation assembly.

The LPP-1/1A Life Preserver Assembly (see figure 9-3) weighs approximately 3 pounds and provides a minimum of 29 pounds of buoyancy. The LPP-1/1A Life Preserver Assembly consists of a single-compartment yoke-type flotation assembly, a pouch and belt assembly, an inflation assembly, and a storage container. Survival items are also provided. To make up the LPP-1/1A Life Preserver Assembly, all required components not supplied with the preserver must be individually requisitioned.

The flotation assembly is constructed of chloroprene-coated nylon cloth. It is equipped with an oral inflation valve, a valve stem, survivor locator light attachments, a whistle pocket, a belt loop, and an inspection record patch (figure 9-3).

The pouch and belt assembly consists of a rubber-coated nylon cloth pouch and an adjustable belt. The pouch contains the flotation assembly and survival items. The belt consists of a 53-inch piece of webbing, an adjustable buckle and clasp, a toggle assembly, and a life line pocket. The belt adjusts from a waist size of 30 to 52 inches and attaches the flotation assembly and pouch to the wearer by means of the belt loop on the flotation assembly and the slots in the back of the pouch. The toggle assembly consists of a wooden toggle and life line. It is used to secure survivors together while they are in the water. When not in use, the life line is wrapped around the wooden toggle and stowed in a pocket located on the belt (figure 9-3).

NOTE

The carbon dioxide cylinder is not supplied with the preserver assembly and must be requisitioned separately.

The LPP-1 inflation assembly consists of a Type I (MIL-C-25369), 25- to 28-gram carbon dioxide cylinder and an inflation valve. The LPP-1A inflation assembly consists of a Type II (MIL-C-25369), 28- to 31-gram carbon dioxide cylinder and an inflation valve (MIL-I-23145). The inflation assembly is connected to the valve stem on the front of the flotation assembly. The valve stem is equipped with a check valve which prevents leakage.

The storage container is used to store the life preserver assembly when it is not in use. The storage container also has donning instructions printed on it.

APPLICATION

As LPP-1/1A life preservers become available, the use of all other life preservers by personnel authorized to use the LPP-1/1A shall be discontinued. Passengers whose total clothing and equipment weight does not exceed 15 pounds and who are not carrying any high density items like weapons or other similar metallic items are authorized to continue use of MK-2 life preserver.

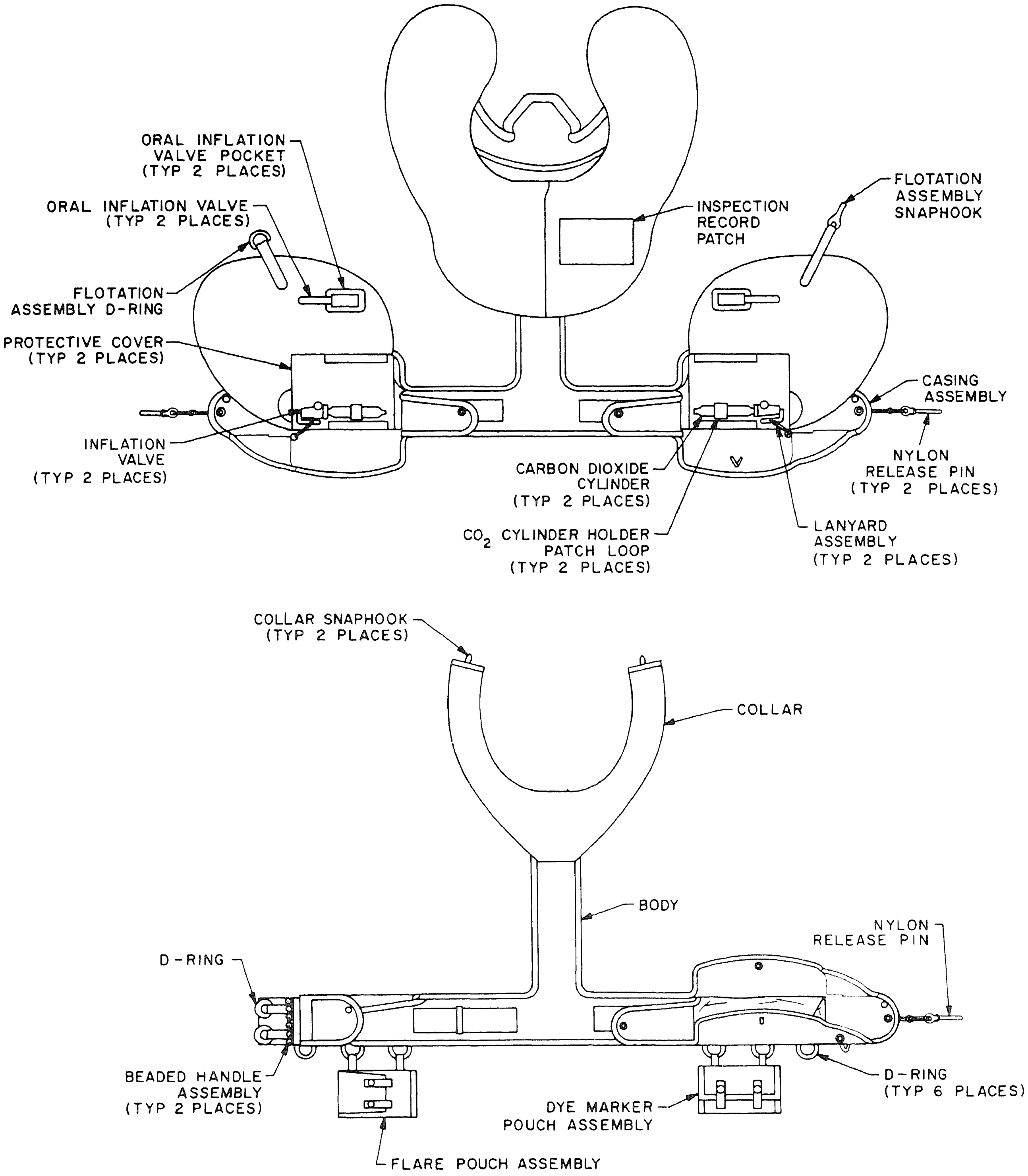
ORAL INFLATION VALVE POCKET (TYP 2 PLACES)
ORAL INFLATION VALVE (TYP 2 PLACES)
FLOTATION ASSEMBLY D-RING
PROTECTIVE COVER (TYP 2 PLACES)
INFLATION VALVE (TYP 2 PLACES)
INSPECTION RECORD PATCH
FLOTATION ASSEMBLY SNAPHOOK
CASING ASSEMBLY
NYLON RELEASE PIN (TYP 2 PLACES)
CARBON DIOXIDE CYLINDER (TYP 2 PLACES)
CO2 CYLINDER HOLDER PATCH LOOP (TYP 2 PLACES)
LANYARD ASSEMBLY (TYP 2 PLACES)
COLLAR SNAPHOOK (TYP 2 PLACES)
COLLAR
BODY
NYLON RELEASE PIN
D-RING
BEADED HANDLE ASSEMBLY (TYP 2 PLACES)
DYE MARKER POUCH ASSEMBLY
D-RING (TYP 6 PLACES)
FLARE POUCH ASSEMBLY

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Figure 9-2.—LPU-21B/P Life preserver assembly, parts nomenclature.

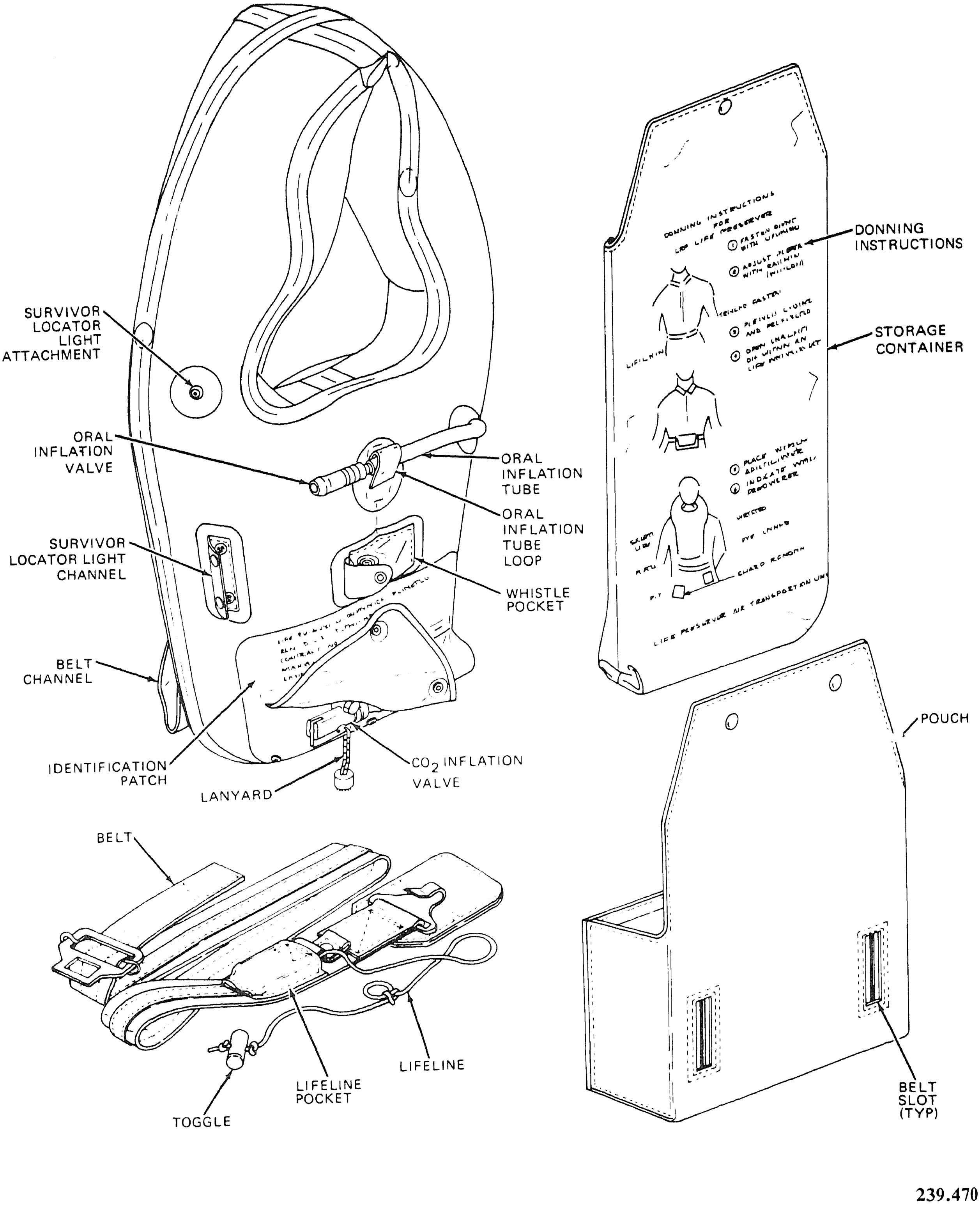

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Figure 9-3.—LPP-1/1A Life preserver assembly.

The attritional basis method will be used to replace the MK-2 life preserver.

LIFE PRESERVER INSPECTIONS

All life preservers need to have Preflight, Special, and Calendar/Phase Inspections.

The Preflight Inspection shall be performed before each flight by the aircrewman to whom the life preserver is assigned. A Preflight Inspection shall also be performed by assigned aircrewmen on life preservers installed in aircraft.

The Special Inspection shall be done on all aircraft-installed life preservers at intervals not to exceed 30 days. The inspection shall be performed at the organizational level of maintenance by personnel assigned to the Aviator's Equipment Branch.

When the Special Inspection is completed and the life preserver is found satisfactory, the inspection date and inspector's signature are written in the inspection section of the Aviation Crew Systems History Card. The 30-Day Special Inspection may be recorded on a separate history card from the history card recording Calendar/Phase Inspections, functional checks, and modifications.

NOTE

> The Calendar Inspection interval for LPA type and LPU-2i/P series preservers assigned to VP squadron selected air reserve aircrewmen has been extended to 180 days from 90 days, providing the preservers are stowed under controlled conditions.

The Calendar/Phase Inspection must be performed on all life preservers prior to placing them in service. After that, the inspection cycle is as follows: personal issue life preservers are inspected once every 90 days. Aircraft-installed life preserver inspection shall coincide with the inspection cycle of the aircraft in which installed. In no case shall the interval exceed 225 days. Unless operational requirements demand otherwise, the life preserver Calendar/Phase Inspection shall be performed by the intermediate level of maintenance or above. As part of inspecting the preserver, the functional test is performed prior to placing it in service, every fourth inspection cycle thereafter, and whenever an inflation assembly is replaced. Also, the leakage test shall be performed during every inspection cycle. A battery visual inspection for the LPU-23/P series and LPU-24/P series will be performed prior to placing life preservers in service, and every fourth inspection cycle thereafter.

NOTE

> For information pertaining to the MK-1 Flight Deck Life Preserver, refer to MIL-L-24247A (Ships) with Amendment 1 and MRC deck H-402 Q1 (order from Manager, Maintenance Management Field Office West (Code 04-D), Naval Station Box 45, San Diego, California 92136). Cognizant activity for MK-1 life preserver is Naval Ships Engineering Center, Center Bldg (Code NSEC-6132E), Hyattsville, Maryland 20782.

FUNCTIONAL TESTING

Before you attempt to perform a functional test, you should ensure that the work area surrounding the preserver is free of all foreign objects. This is done to prevent any accidental damage to the life preserver. When you perform a functional check you want to ensure that the system operates as if the aircrew member were using it in an emergency. Therefore, your first step is to pull the actuation toggle.

The preserver should fully inflate to its design shape without any evidence of restriction, in less than 30 seconds. If the preserver does not meet this requirement you will have to determine the reason and correct it. To do this, first look at your stem and valve. Sometimes dirt or foreign matter can cause a slow inflation. If you make any corrections, the preserver shall be functionally tested again.

Deflate the preserver by using a vacuum pump and a 3/8- or 1/2-inch inside diameter rubber hose. Attach one end of the rubber hose to the vacuum pump and the other end will go to the oral inflation valve or to the carbon dioxide cylinder valve, depending on which type you are using. After the preserver has been completely deflated, release the oral inflation valve or put the CO_2 cylinder back into the valve.

The functional check is only performed when the preserver is placed into service and every fourth calendar check after that.

Leakage Test

All life preservers shall be subjected to a leakage test each Calendar/Phase Inspection. This test is performed each time the preserver comes in to be checked, even when a functional test is required. You need a special test fixture to perform this test.

TEST FIXTURE.—A suggested test fixture, consisting of a three-way valve, pressure gage, and adapters for compartments being tested, is shown in figure 9-4. The fixtures are connected to work as shown in the schematic in figure 9-5.

TEST PROCEDURE.—To test life preservers, proceed as follows:

1. Ensure all carbon dioxide has been removed from any preserver which has been functionally tested.
2. To test MK-2 Preserver Outer Chambers, remove the carbon dioxide cylinder from the inflation valve, and install an inflation valve adapter (1, figure 9-4). Rotate the three-way valve control handle to the air supply. Put the fitting at the end of the hose against the life preserver valve stem and inflate the chamber. Shift the valve position valve between the gage, the vent, and the air supply until proper pressure is attained in the chamber.
3. To test all preserver chambers except MK-2 outer chambers, unlock the oral inflation valve and insert it into the rubber hose (3). Shift the valve to the air supply position and inflate chamber. Alternate the position valve between the gage, the vent, and the air supply until proper pressure is attained.
4. Shut off the air supply securely, and after a minimum of 15 minutes, readjust the pressure, if necessary, to the original pressure. Refer to table 9-1.
5. Disconnect the air supply and check test fixture for leaks. Ensure all valves are closed.
6. Record ambient temperature and barometric pressure.
7. Four hours after the readjustment period in step 4, record the test pressure.

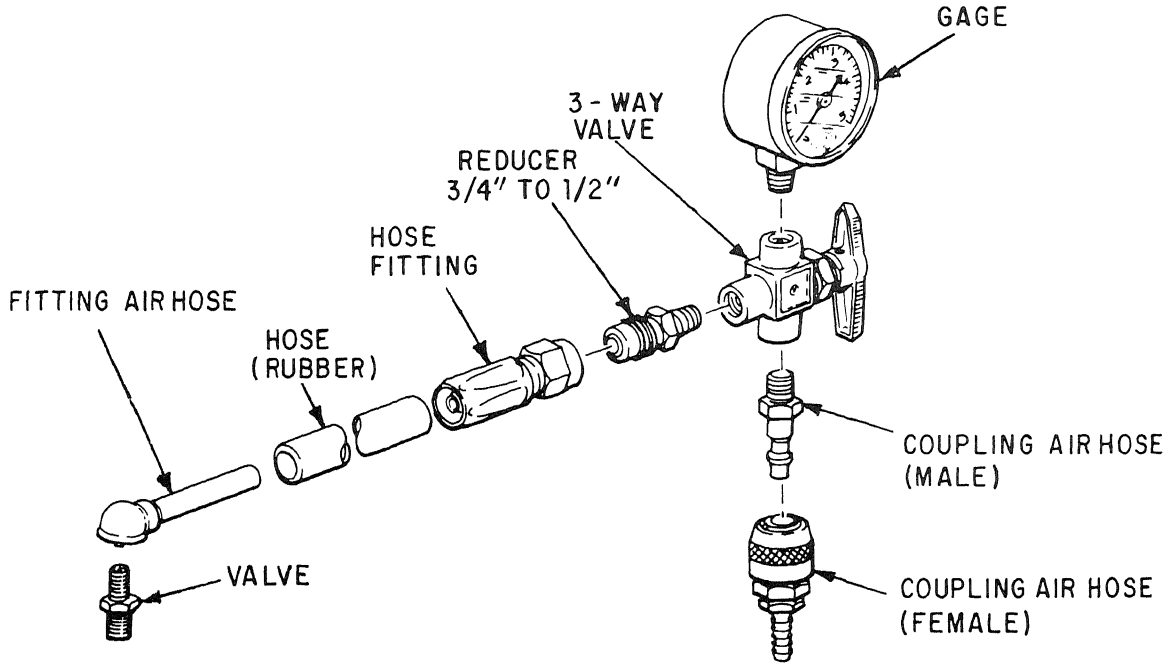

Figure 9-4.—Leakage test fixture life preserver.

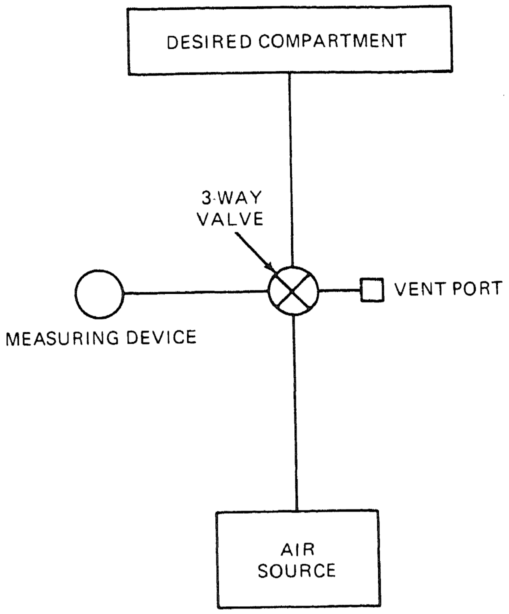

Figure 9-5.—Test rig schematic.

8. Record temperature and barometric pressure, and correct test pressure for any changes in temperature and barometric pressure. Refer to Chapter 8 for conversion charts. Figure 9-6 is an example of how you would record this information.

EXAMPLE

UNCORRECTED TEST READING 1.70 PSI

	TEMP.	BARO.
START END	75°F 70°F	29.90 IN. Hg 29.70 IN. Hg
DIFFERENCE CORRECTION	−5°F +.155	−.20 −.098

TEMP. CORRECTION + .155
+BARO. CORRECTION − .098
CORRECTION + .057

UNCORRECTED READING 1.700 PSI
+CORRECTION + .057
CORRECTED READING 1.757 PSI

Step 8—Para 2-82

Figure 9-6.—Example for recording readings.

Table 9-1.—Life preserver test pressures

Preserver Type	Flotation Chamber Test Sequence	Leakage Test Pressure (psig)	Minimum* Pressure (psig)
LPA-1/1A	Both Chambers Simultaneously	3.5*	1.0
LPA-2 series	Both Chambers Simultaneously	2.0	1.6
LPU-21/P series	Both Chambers Simultaneously	2.0	1.6
LPU-23/P series	Both Chambers Simultaneously	2.0	1.6
LPU-24/P series	Both Chambers Simultaneously	2.0	1.6
LPP, Pouch Type, UDT	Single Chamber Preserver	2.0	1.6
MK-2	Outer Chambers Simultaneously	2.0	1.6
	Inner Chamber	2.0	1.6

*Reduce 3.5 psig to 2.0 psig after 10 minutes.

CAUTION

Do not submerge LPU-23/P series and LPU-24/P series life preservers in water to check for leaks.

After 4 hours, if the pressure of the chamber is below 1.60 psig (1.0 psig for LPA-1/1A chambers), inflate to leakage test pressure and coat it with a soap solution to locate leaks. Mark any leak areas you find. Rinse the preserver with fresh water, air dry it, and repair it in accordance with NAVAIR 13-1-6.1.

If the preserver has held the required pressure, deflate it.

Ensure that the inflation valve lever is cocked. Install a carbon dioxide cylinder.

This completes the testing for leaks within the flotation assembly. To complete the Calendar Inspection, you will have to inspect the remaining components of the life preserver.

VISUAL INSPECTION

The Visual Inspection is performed along with each Calendar Inspection, at which time it is performed before you perform the leakage test. To perform a Visual Inspection, inflate the preserver to 1 psi and look it over real good. Look for any fabric cuts, tears, deterioration, or abrasion. Any of these defects can cause leakage. Check the valve stem for security and ensure that the silver indicator is not visible in the firing check port (indicator hole) (LPU-23/P and LPU-24/P). See figure 9-7. If the silver indicator is visible, the inflator is spent and the automatic feature of the inflator is negated. A new inflator should be installed on the life preserver to replace the previously spent inflator. Refer to NAVAIR 13-1-6.1.

LPU-23/P and LPU-24/P series preservers use the FLU-8/P automatic inflator. The service life of each FLU-8/P series automatic inflator is 3 years. If service life expires prior to the next scheduled calendar inspection, replace the inflator. Refer to NAVAIR 11-100-1, Cartridges and Cartridge Actuated Devices for Aircraft and Associated Equipment. Also refer to NAVAIR 13-1-6.2, Section 2-5, Cartridges and Cartridge-Actuated Devices (General Safety Instructions).

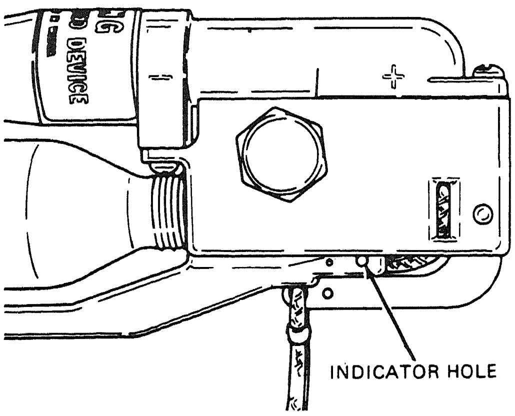

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Figure 9-7.—Checking for silver indicator.

Battery Visual Inspection, LPU-23/P (Series) and LPU-24/P (Series)

To inspect batteries installed in the FLU-8/P series inflator, proceed as follows:

With the aid of a standard box wrench, remove the sensor plug cap. See that the cap doesn't have any cracks. Remove the batteries and look at them for possible leakage or corrosion. Replace them if they do.

Each battery has stamped on it a two-letter code corresponding to the month and year of manufacture. Refer to table 9-2. Batteries have a total life of 2 years from the date of manufacture. Replace both batteries if the total life of either battery expires prior to the next Calendar Inspection.

Check this date of manufacture on each battery. Also check the date of installation recorded on the Aviation Crew Systems History Card.

Reinstall or replace batteries if needed. Ensure that the date of installation and the date of manufacture are recorded on the Aviation Crew Systems History Card. See figure 9-8 for proper battery arrangement.

Battery Voltage Testing, LPU-23/P (Series) and LPU-24/P (Series)

Before installing any battery, you must be sure that it has enough energy to operate the FLU-8/P inflator. You must use a digital reading voltage

Table 9-2.—Battery dates of manufacturing codes

Month	Year 1978	1979	1980	1981	1982	1983
January	VB	KU	VN	KI	VC	KA
February	FB	AU	FN	AI	FC	AA
March	XB	YU	XN	YI	XC	YA
April	BB	IU	BN	II	BC	IA
May	ZB	UU	ZN	UI	ZC	UA
June	LB	CU	LN	CI	LC	CA
July	DB	WU	DN	WI	DC	WA
August	RB	PU	RN	PI	RC	PA
September	OB	EU	ON	EI	OC	EA
October	JB	GU	JN	GI	JC	GA
November	TB	SU	TN	SI	TC	SA
December	HB	MU	HN	MI	HC	MA

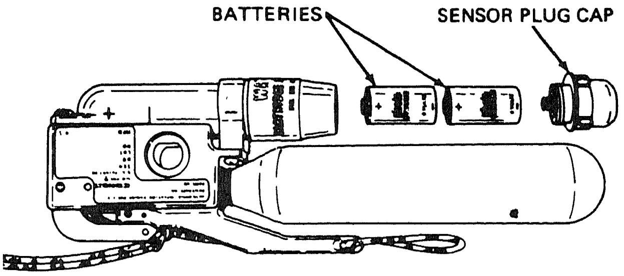

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Figure 9-8.—Battery arrangement.

multimeter to do this. The test leads of this multimeter should be provided with a standard test probe (−) and a standard alligator clip (+). When using the multimeter, you should ensure that it is set in the voltage-measuring mode and NOT the resistance-measuring mode. A resistance measurement will trigger the squib and fire the inflator.

Attach the alligator clip (+) to the manual actuator lever and insert the test probe (−) into the hole at the end of the sensor plug assembly. Refer to figure 9-9.

After you connect the test leads to the inflator, wait 15 seconds for the capacitor in the multimeter to charge and then take a voltage reading. Refer to table 9-3 to interpret the reading.

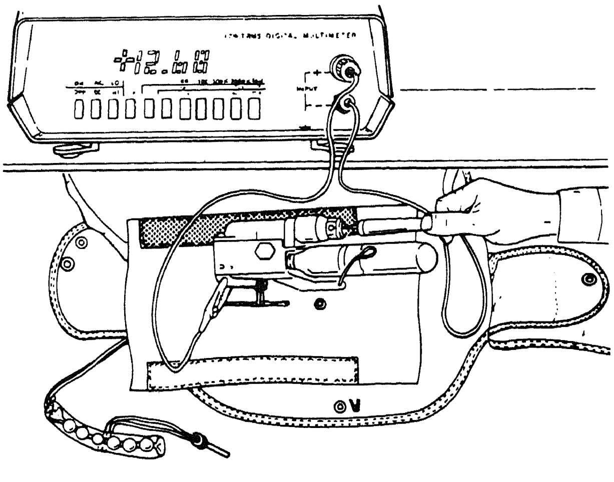

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Figure 9-9.—Testing battery.

A reading of plus 12 volts or more indicates the batteries are at full power and installed correctly. A reading of minus 12 volts or less indicates that both batteries are installed backwards. A reading of zero volts indicates that one battery is installed backwards. Any reading of other than plus 12 volts requires either properly arranging or completely replacing the batteries. If one or both batteries fail this test, replace both batteries.

INFLATION ASSEMBLY INSPECTION

Inspect life preserver inflation assemblies as follows:

Remove the carbon dioxide cylinder from the valve assembly.

Table 9-3.—Test battery readings

Voltage Reading	Maintenance Required
− 12V	Both batteries installed backwards
0V	One battery installed backwards
.1V to 11.99V	Replace both batteries
+ 12V or above	Batteries at full power

Examine the inflation device, actuating lever and lanyard, and locking pins for fraying, corrosion, stripped threads, and other damage.

If required, remove any sharp edges from the valve with a fine, round file.

(LPP and LPA-1/1A Life Preservers) Operate the toggle three or four times. Ensure that the lever moves freely and the piercing pin moves properly inside valve body.

(Life preservers with beaded inflation handles) Operate beaded inflation handle three or four times. Ensure that the lever moves freely and the piercing pin moves properly inside valve body.

Ensure that the packaging cord loop is not pinched between the piercing pin and the actuating lever. If there is free play in the actuating lever when it is in its cocked position, the packaging cord loop is pinched. If necessary, reinstall the cord. Refer to NAVAIR 13-1-6.1.

NOTE

Each time the inflation assembly gaskets or the inflation assembly is removed and replaced for any reason, a functional test shall be conducted. Use new gaskets when you replace the device.

If any discrepancy is noted in the inflation device that is not repairable, remove the assembly and install a new inflation device.

(LPA Type, LPU-21/P and MK-2 Life Preservers) If carbon dioxide cylinder locking screws are installed, remove them.

(LPP, LPA-1/1A, LPA-2 series, and LPU-21/P series Life Preservers) Inspect for buildup of corrector fluid in the inflator.

Inflation Lanyard Pull Test

Special Equipment Required

Quantity	Description	Reference Number
1	Pull-Scale, 0 to 50 lb	DPP-50 or equivalent

To perform the inflation lanyard pull test, proceed as follows:

1. Ensure that the carbon dioxide cylinders have been removed. Actuate the inflation assembly. This test is testing the lanyard itself. It isn't designed to test the pull of the inflation assembly.
2. (Life preservers with beaded inflation handles) Attach a pull scale to top end (end opposite inflation lanyard) of beaded inflation handle (see figure 9-10).

2A. (LPP and LPA-1/1A Life Preservers) Attach the pull scale to the actuating lanyard at the binder knot immediately above the knob.

3. Exert a 25-pound straight pull on the inflation lanyard. Remove scale.
4. Examine the inflation lanyard for frays, ruptures, thin spots, split casing, and security of knots.
5. Replace any unsatisfactory inflation lanyards.

Installation of Cylinders, LPA-1/1A (Series), LPA-2 (Series), LPU-21/P (Series), MK-2 (Series), LPP-1 (Series)

Prior to installing any CO_2 cylinder, it must be weighed and the threads cleaned. By using the Cylinder Thread Chaser Die, you turn the thread chaser to the full extent of the threads on the CO_2 cylinder to cut free any excessive cadmium plating covering the threads (figure 9-11).

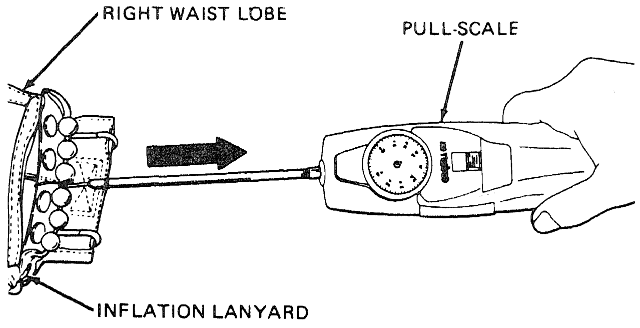

Figure 9-10.—Inflation lanyard pull test.

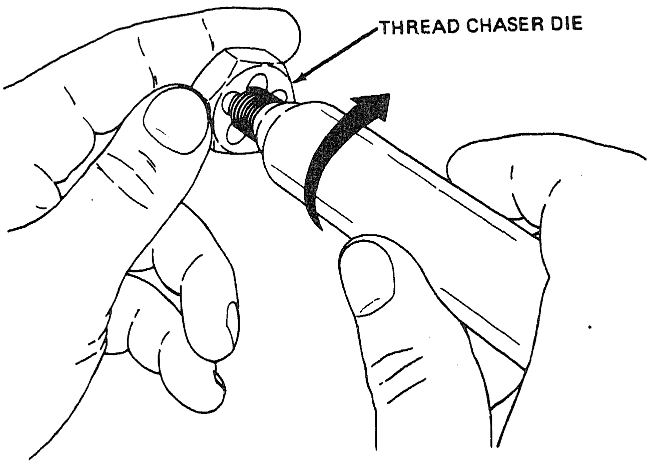

Figure 9-11.—Cleaning threads.

Weigh the charged cylinder and compare the stamped minimum weight with the scale weight. Discard and replace the cylinder if the scale weight is 2 grams less than stamped minimum weight. Loosen the inflator setscrew if it is installed and ensure that the inflator lever is in the cocked position. Apply a light coat of typing correction fluid on the puncturable face of the cylinder. As you hold the inflator assembly with the opening facing up, drop a test washer (refer to NAVAIR 13-1-6.1) into the inflator. Ensure that the test washer is the proper size and lies flat on the inflator seat.

CAUTION

Steel threads on carbon dioxide cylinders can cause damage to aluminum threads on inflators if the cylinder is not carefully threaded. If binding occurs during threading, replace the cylinder.

Screw the CO_2 cylinder into the inflator until the seating is apparent. Remove the CO_2 cylinder and inspect the test washer for evidence of contact with the CO_2 cylinder. It will be indicated by transferral of white fluid from the CO_2 cylinder onto the test washer.

If there is evidence that the cylinder did seat properly, wipe the puncturable face of the cylinder clean and rescrew it into the inflator until fully seated. Tighten setscrews.

If the cylinder did not seat on the test washer, obtain another cylinder and repeat test.

NOTE

When you replace the CO_2 cylinder to the inflator, ensure that the CO_2 cylinder passes through the holding patch loop.

Ensure that the test washer is removed from the inflator before the final installation of good cylinder.

Do not install the setscrews in the MK-2, LPA-1/1A, LPA-2 and LPU-21/P life preservers. For all other life preservers, a missing setscrew does not warrant removal of the preserver from service until a replacement setscrew can be obtained.

Safety-wire the inflator as required.

Installation of Cylinders, LPU-23/P (Series) and LPU-24/P (Series)

To install cylinders, proceed as follows:

Weigh a charged CO_2 cylinder and compare the stamped minimum weight with the scale weight. Discard and replace the cylinder if its scale weight is 2 grams less than its stamped minimum weight.

By using the Cylinder Thread Chaser Die, figure 9-11, you turn the thread chaser to the full extent of the threads on the CO_2 cylinder to cut free any excessive cadmium plating covering the threads.

Insert new O-ring and turn the CO_2 cylinder into inflator body as far as hand twisting permits. See figure 9-12.

Battery Replacement, LPU-23/P (Series) and LPU-24/P (Series)

To replace batteries, proceed as follows:

Remove the sensor plug cap with a standard box wrench.

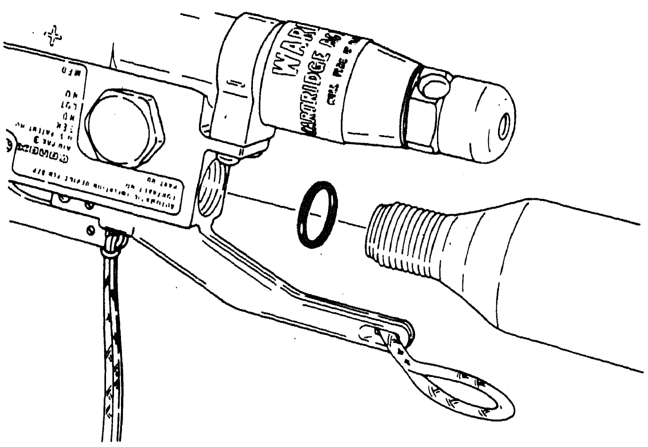

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Figure 9-12.—Inserting new O-ring and CO_2 cylinder.

WARNING

Batteries may explode if recharged or disposed of in a fire.

Remove the old batteries and discard them.

Remember to record the date of manufacture and the date of installation of new batteries on Aviation Crew Systems History Card.

NOTE

Batteries have a total life of 2 years from the date of manufacture. Do not install batteries if their total life expires prior to the next scheduled Calendar Inspection.

Install batteries in accordance with figure 9-8.

WARNING

Do not interchange the sensor plug cap used on FLU-8/P with the sensor plug cap used on FLU-8A/P. Ensure that the sensor plug cap is torqued to the correct value.

(FLU-8/P only) Torque the sensor plug cap to 16 ± 2 inch-pounds using 5/8-inch socket and torque wrench.

(FLU-8A/P only) Torque the sensor plug cap to 8 ± 1 inch-pound using 17/32-inch socket and torque wrench.

CHAPTER 10

OXYGEN AND RELATED COMPONENTS

OXYGEN

No one can live unless he is able to get sufficient quantities of food, water, and oxygen. Of the three, oxygen is by far the most urgently needed. If necessary, a well-nourished man can go without food for many days or weeks, living on what is stored in his body. The need for water is more immediate but still the need does not become critical for several days. The amount of oxygen in the body is limited at best to a few minutes supply. When that supply is exhausted, death is prompt and inevitable.

Oxygen starvation affects a pilot or aircrewman in much the same way that it affects an aircraft engine—neither can function without it. The engine requires oxygen for burning the fuel that keeps it going. An engine designed for low-altitude operation loses power and performs poorly at high altitudes. High-altitude operation demands a means of supplying air at higher pressure to give the engine enough oxygen for the combustion of its fuel. The supercharger or compressor performs this function.

The combustion of fuel in the human body is the source of energy for everything the aviator is required to do with his muscles, with his eyes, and with his brain. As the aircraft climbs, the amount of oxygen per unit of volume of air decreases and the aviator's oxygen intake, therefore, is reduced. Unless he breathes additional oxygen, his eyes, his brain, and his muscles begin to fail him. He is designed for low-altitude operation and will not give satisfactory performance unless he is supplied the full amount of oxygen that his body requires. Like the engine, the body requires a means of having this oxygen supplied to it in greater amounts or under greater pressure. This need is satisfied by the use of supplemental oxygen supplied directly to the respiratory system through an oxygen mask, by pressurizing the aircraft to an atmospheric pressure equivalent to that of safebreathing altitudes, or both.

For purposes of illustration, an aviator's lungs may be compared to a bottle of air. If an open bottle is placed in an aircraft at sea level, air escapes from it continuously as the aircraft ascends. The air pressure at 18,000 feet is only half the amount as that at sea level; therefore, at 18,000 feet the bottle is subjected to only half the atmospheric pressure it was subjected to at sea level. For this reason, it will contain only half the oxygen molecules it had when on the ground.

In like fashion, an aviator's lungs contain less and less air as he ascends, and correspondingly less oxygen. Thus, the use of supplemental oxygen is an absolute necessity on high-altitude flights. Above 35,000 feet, normal activity is possible up to about 43,000 feet by use of positive pressure equipment. This equipment consists of a "supercharger" arrangement by which the oxygen is supplied to the mask under a pressure slightly higher than that of the surrounding atmosphere. Upon inhalation, the oxygen is forced into the lungs by the system pressure. Upon exhalation, the oxygen flow is shut off automatically so that carbon dioxide can be expelled from the mask. Normal activity is possible to 50,000 feet with the use of a pressure breathing oxygen regulator. Above 50,000 feet, the only adequate provision for the safety of the aviator is pressurization of the entire body.

Up to about 35,000 feet, an aviator can keep a sufficient concentration of oxygen in his lungs to permit normal activity by use of demand oxygen equipment that supplies oxygen upon demand (inhalation). The oxygen received by the body on each inhalation is diluted with decreasing amounts of air up to about 30,000 feet. Above this altitude up to about 35,000 feet, this equipment provides 100 percent oxygen. At about 35,000 feet, inhalation alone will not provide enough oxygen with this equipment.

EFFECTS OF HYPOXIA

A decrease in the amount of oxygen per unit volume of air results in an insufficient amount of oxygen entering the bloodstream. The body reacts to this condition rapidly. This deficit in oxygen is called HYPOXIA. A complete lack of oxygen, which causes death, is called ANOXIA. If the body is returned to its normal oxygen supply, one may recover from hypoxia, but cannot recover from anoxia.

Many persons are not aware of the enormous increase in the need for oxygen, caused by an increase in physical activity. Strenuous calisthenics or a cross-country run results in deep and rapid breathing. Even so mild an exercise as getting up and walking around a room may double the air intake. In the case of the aviator, a leaking oxygen mask which may go completely unnoticed while the wearer is at rest may lead to collapse and unconsciousness when he attempts to move about from one station to another in the aircraft. A walkaround (portable) oxygen bottle sufficient for 24 minutes of quiet breathing may be emptied by 17 minutes of use when the user is moving about the aircraft.

People differ in their reactions to hunger, thirst, and other sensations. Even an individual's reactions vary from time to time under different circumstances. Illness, pain, fear, excessive heat or cold, and many other factors govern what the response will be in each particular case. The same thing is true of individual reactions to oxygen starvation. The effects of a certain degree of hypoxia on a given person cannot be accurately predicted. For instance, a person may be relatively resistant on one day, but highly susceptible the next.

It is difficult to detect hypoxia, because its victim is seldom able to judge how seriously he is affected, or often that he is affected at all. The unpleasant sensations experienced in suffocation are absent in the case of hypoxia. Blurring of vision, slight shortness of breath, a vague weak feeling, and a little dizziness are the only warnings. Even these may be absent or so slight as to be unnoticeable.

While still conscious, the aviator may lose all sense of time and spend his last moments of consciousness in some apparently meaningless activity. In such a condition he is a menace to his crew as well as to himself. Since the aviator understands that it is the reduced air pressure at higher altitudes which determines the effect upon his body, he depends upon the altimeter rather than his sensations or judgment to tell him when he needs oxygen.

CHARACTERISTICS OF OXYGEN

Oxygen, in its natural state, is a colorless, odorless, and tasteless gas. Oxygen is considered to be the most important to life of all the elements. It forms about 21 percent of the atmosphere by volume and 23 percent by weight.

Of all the elements in the universe, oxygen is the most plentiful. It makes up nearly one-half of the earth's crust and approximately one-fifth of the air we breathe.

Oxygen combines with most of the other elements. The combining of an element with oxygen is called oxidation. Combustion is simply rapid oxidation. In almost all oxidations, heat is given off. In combustion, the heat is given off so rapidly it does not have time to be carried away; the temperature rises extremely high, and a flame appears.

Some examples of slow oxidation are the rusting of iron, drying of paints, and the changing of alcohol into vinegar. Even fuels in storage are slowly oxidized, the heat usually being carried away fast enough; however, when the heat cannot easily escape, the temperature may rise dangerously and a fire will break out. This is called spontaneous combustion.

Oxygen does not burn, but does support combustion. Nitrogen neither burns nor supports combustion. Therefore, combustible materials burn more readily and more vigorously in oxygen than in air, since air is composed of about 78 percent nitrogen by volume and only about 21 percent oxygen.

In addition to existing as a gas, oxygen can exist as a liquid and as a solid. Liquid oxygen is pale blue in color. It flows like water, and weighs 9.54 pounds per gallon.

Liquid oxygen, commonly referred to as LOX, is normally obtained by a combined cooling and pressurization process. When the temperature of gaseous oxygen is lowered to – 182 °F under about 750 psi pressure, it will begin to form into a liquid. When the temperature is lowered to – 297 °F, it will remain a liquid under normal atmospheric pressure.

Once converted into a liquid, oxygen will remain in its liquid state as long as the temperature is maintained below – 297 °F. The liquid has an expansion ratio of 862 to 1, which means that one volume of liquid oxygen will expand 862 times when converted to a gas at atmospheric pressure. Thus, 1 liter of liquid oxygen produces 862 liters of gaseous oxygen.

Until a few years ago, all oxygen carried in naval aircraft was in the gaseous state. As flight durations increased, however, it was found that the weight and space problems involved with carrying increasing amounts of gaseous oxygen were becoming intolerable. LOX has proven the answer to these problems. In its liquid state, oxygen can be "packed" into containers small and light enough to be carried even in fighter type aircraft without weight and space penalty.

In the aircraft, oxygen in the liquid state is carried in a container called a converter. This is a double-walled, vacuum-insulated container similar to the common Thermos bottle. The converter is equipped with the necessary valves and tubing for vaporizing the liquid and warming the gas to cockpit temperatures.

TYPES OF OXYGEN

Aviator's breathing oxygen (MIL-O-27210C) is supplied in two Types (I and II). Type I is gaseous oxygen, and Type II is LOX. Oxygen procured under the above specification is required to be 99.5 percent pure. The water vapor content must not be more than 0.02 milligram per liter when tested at 70 °F and at sea level pressure. This is practically bone dry.

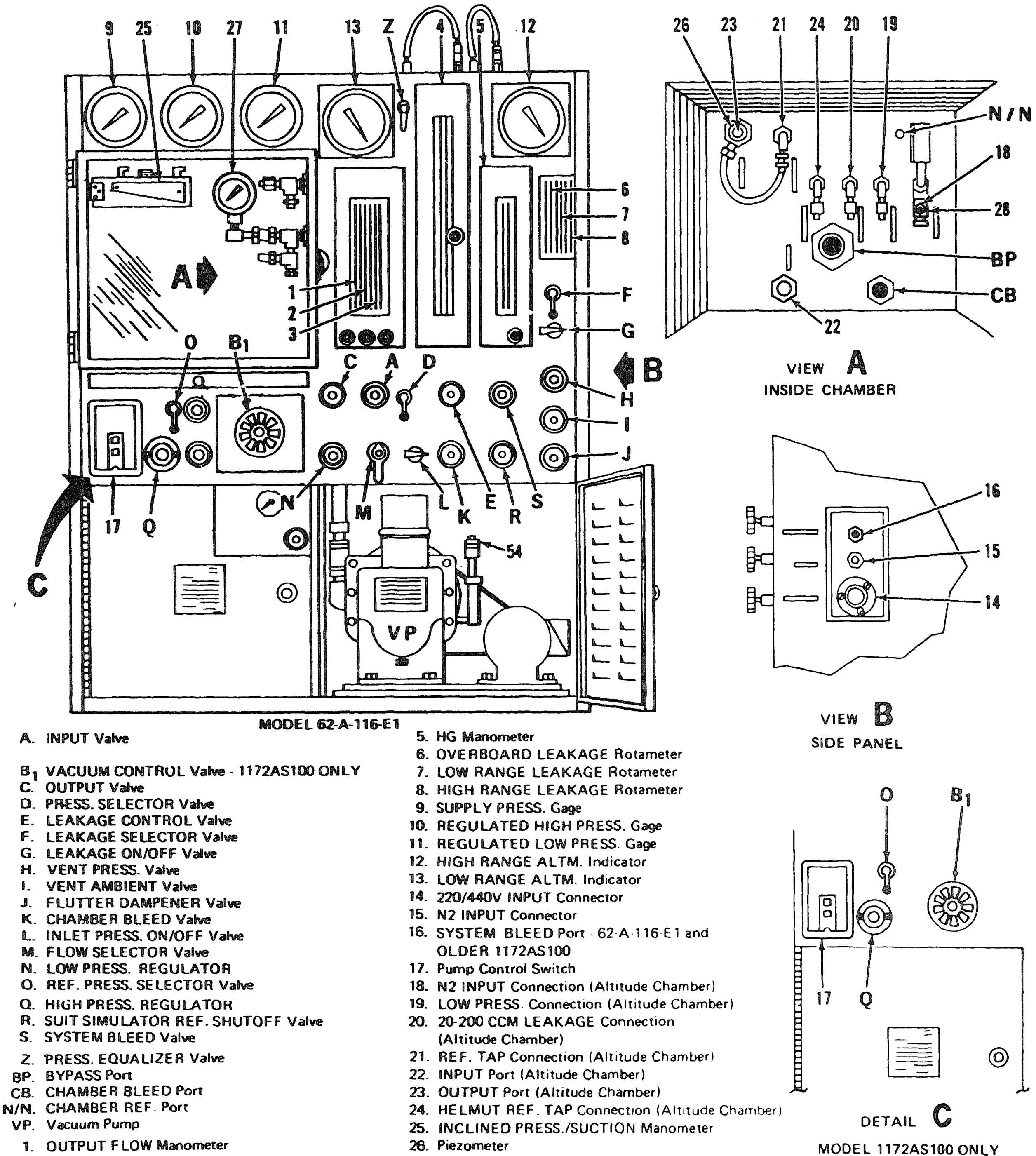
Technical oxygen, both gaseous and liquid, is procured under specification BB-0-925. The moisture content of technical oxygen is not as rigidly controlled as that of breathing oxygen; therefore, the technical grade should never be used in aircraft oxygen systems.

The extremely low moisture content required of breathing oxygen is not to avoid physical injury to the body, but to ensure proper operation of the oxygen system. Air containing a high percentage of moisture can be breathed indefinitely without any serious ill effects. However, the moisture affects the aircraft oxygen system in the small orifices and passages in the regulator. Freezing temperatures can clog the system with ice and prevent oxygen from reaching the user. Therefore, extreme precautions must be taken to safeguard against the hazards of water vapor in oxygen systems.

OXYGEN COMPONENT TEST STAND 1172AS100

Aircrew Survival Equipmentmen are responsible for shop testing aircraft oxygen system components, including regulators, emergency oxygen systems, and other items. The AME is responsible for checking system components in the aircraft; however, in case of a suspected malfunction and for periodic maintenance testing, the component is removed from the aircraft and brought to the oxygen shop where it is tested by the PR. This testing is accomplished with the use of various types of test equipment, some of which are discussed in this chapter.

Regulator test stands are designed for testing oxygen regulators for flow capacities, oxygen concentrations, pressure characteristics, and various leakage tests at different simulated altitudes. There are several models of test stands capable of testing the oxygen regulators, converters, etc. We will cover only the ones that most oxygen shops throughout the Navy use. If you happen to work in an oxygen shop that is using outdated equipment, see the petty officer who is in charge of the work center and he will be able to show you the literature that covers that equipment. In this rate training manual, we will discuss only the 1172AS100 test stand used for testing oxygen regulators.



A. INPUT Valve
B_1 VACUUM CONTROL Valve - 1172AS100 ONLY
C. OUTPUT Valve
D. PRESS. SELECTOR Valve
E. LEAKAGE CONTROL Valve
F. LEAKAGE SELECTOR Valve
G. LEAKAGE ON/OFF Valve
H. VENT PRESS. Valve
I. VENT AMBIENT Valve
J. FLUTTER DAMPENER Valve
K. CHAMBER BLEED Valve
L. INLET PRESS. ON/OFF Valve
M. FLOW SELECTOR Valve
N. LOW PRESS. REGULATOR
O. REF. PRESS. SELECTOR Valve
Q. HIGH PRESS. REGULATOR
R. SUIT SIMULATOR REF. SHUTOFF Valve
S. SYSTEM BLEED Valve
Z. PRESS. EQUALIZER Valve
BP. BYPASS Port
CB. CHAMBER BLEED Port
N/N. CHAMBER REF. Port
VP. Vacuum Pump
1. OUTPUT FLOW Manometer
2. INPUT FLOW Manometer
3. VENT FLOW Manometer
4. PRESS./SUCTION Manometer
5. HG Manometer
6. OVERBOARD LEAKAGE Rotameter
7. LOW RANGE LEAKAGE Rotameter
8. HIGH RANGE LEAKAGE Rotameter
9. SUPPLY PRESS. Gage
10. REGULATED HIGH PRESS. Gage
11. REGULATED LOW PRESS. Gage
12. HIGH RANGE ALTM. Indicator
13. LOW RANGE ALTM. Indicator
14. 220/440V INPUT Connector
15. N2 INPUT Connector
16. SYSTEM BLEED Port 62-A-116-E1 and OLDER 1172AS100
17. Pump Control Switch
18. N2 INPUT Connection (Altitude Chamber)
19. LOW PRESS. Connection (Altitude Chamber)
20. 20-200 CCM LEAKAGE Connection (Altitude Chamber)
21. REF. TAP Connection (Altitude Chamber)
22. INPUT Port (Altitude Chamber)
23. OUTPUT Port (Altitude Chamber)
24. HELMUT REF. TAP Connection (Altitude Chamber)
25. INCLINED PRESS./SUCTION Manometer
26. Piezometer
27. N2 INPUT PRESS. Gage
28. Tee Connector
54. Vacuum Pump Vent

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Figure 10-1.—Controls and indicators for Oxygen System Components Test Stand Model 1172AS100.

The Oxygen System Components Test Stand Model 1172AS100 tests and evaluates miniature oxygen breathing regulators as well as panel and console mounted oxygen breathing regulators. (See figure 10-1.)

Oxygen System Components Test Stands are supplied by more than one manufacturer. The operation, maintenance and parts are, with a few minor exceptions, identical. Where there are differences in applications, or where operational procedures differ, they will be described in the individual regulator chapters of the NAVAIR publication 13-1-6.4. Therefore, before you attempt to test any oxygen component you have to refer to that manual.

The Oxygen System Components Test Stand consists of a nitrogen pressure source and a vacuum system. It includes the valving and instrumentation necessary to measure, test and evaluate the performance and operating characteristics of oxygen system components at altitudes up to 150,000 feet.

Performance of the test stand is dependent upon the skill of the operator. You must be thoroughly familiar with the instruments, controls and connections which comprise the systems that are incorporated within the test stand (figure 10-1).

ON/OFF VALVES

There are two ON/OFF valves on the test stand. These valves are colored red and have two positions—ON and OFF. The first valve is called the Inlet Pressure ON/OFF valve (L). This valve permits a flow of regulated high- or low-pressure nitrogen to the input connection (18) located inside the altitude chamber. The second ON/OFF valve is called the Leakage ON/OFF valve (G). This valve permits a flow of regulated low-pressure nitrogen gas (N_2) through the selected in-system rotameter (7) or (8). You select either the low-range or the high-range rotameter by using the Leakage Selector valve (F). Valve (G), the Leakage ON/OFF valve, also permits a supply of N_2 to go to the input connection (18) inside the chamber. The only time you will be using ON/OFF valve (G) is when you are adjusting the bleed on a miniature oxygen regulator (this is covered in the NAVAIR 13-1-6.4) and when you are measuring leakage on oxygen components.

SELECTOR VALVES

As you look at the Model 1172AS100 Test Stand, you may think that with all those different valves, gages, rotameters, and connections that you could never operate it. However, by operating only four selector valves, you can direct the flow of N_2 to perform the basic functions of the stand. These valves are M, O, D, and F, in figure 10-1.

The FLOW SELECTOR valve (M) has two positions, CONTROLLER and REGULATOR. When this valve is placed in the REGULATOR position, and you open the OUTPUT valve (C), the flow is routed directly from the item under test through the Piezometer (26) and OUTPUT port (23) to the vacuum pump. When the selector valve is placed in the CONTROLLER position, the flow is routed through the Suit Simulator Tank.

The REFERENCE PRESSURE SELECTOR valve (O) is a two-position valve. It references pressure to either the altitude chamber or the suit simulator tank from LOW RANGE ALTIMETER (13).

The PRESSURE SELECTOR valve (D) has two positions; H_2O (water) and Hg (mercury). In the Hg position, only mercury pressure can be read. In the H_2O position, either inches of water pressure (positive pressure) or inches of water suction (negative pressure) can be read.

The LEAKAGE SELECTOR valve (F) has two positions—HIGH and LOW. It routes regulated low pressure through the in-system rotameters. When the valve is placed in the LOW position, leakage is indicated on rotameter (7). Valve (F) is always left in the HIGH position unless you are reading a leak or bleed below 200 cubic centimeters (CCM). This is done to prevent damage to the low-range rotameter in the event you develop a severe leak.

VOL-O-FLO ELEMENTS

In order to understand the function of some of the valves in the following paragraphs, it is necessary to first understand the function of the Vol-O-Flo elements installed between certain control valves and their indicating manometers. There are three Vol-O-Flo elements installed on the test stand. The input Vol-O-Flo works in conjunction with INPUT valve (A) and INPUT FLOW manometer (2). The output Vol-O-Flo is used with OUTPUT valve (C) and OUTPUT FLOW manometer (1). The vent flow Vol-O-Flo is used with either the VENT PRESSURE valve (H) or the VENT AMBIENT valve (1) and the VENT FLOW manometer (3).

The Vol-O-Flo elements have two taps; one near the inlet end and one near the outlet end. (See figure 10-2.) Baffles inside the element create a flow restriction. As air or nitrogen enters the element, a pressure buildup is created at the inlet end; as it flows past the baffles, a pressure drop occurs at the outlet end. The inlet (pressure buildup) tap is connected to the bottom of the indicating manometer, and the outlet (pressure drop) tap is connected to the top of the manometer. As the control valve is opened, gas flows from the valve through the Vol-O-Flo and the pressure drop thus created allows the fluid in the manometer to rise. The operator reads the amount of flow passing through the Vol-O-Flo on the indicating manometer.

CONTROL VALVES

A control valve regulates, or restricts, a specified flow. Two types of control valves, measuring and nonmeasuring, are used on the test stand. Measuring control valves have measuring devices (gages or manometers) to visually measure the flow through the valve as it is opened. Nonmeasuring control valves have no indicating devices. There are six measuring, and three nonmeasuring control valves on the test stand.

Measuring Control Valves

The measuring control valves are:

1. The INPUT valve (A) allows a measurable flow of air into the altitude chamber. It can only be used during simulated altitude conditions. As the chamber altitude increases, pressure inside the chamber decreases, and the ambient air pressure outside the chamber is greater. When valve (A)

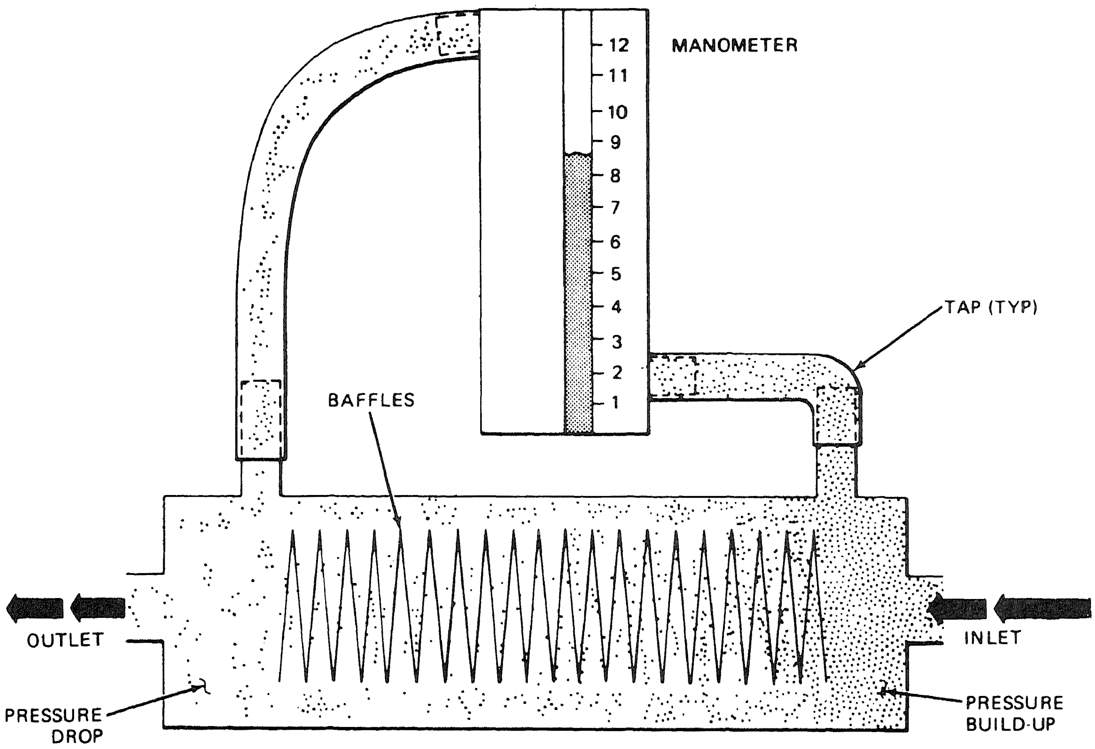

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Figure 10-2.—Vol-O-Flo element.

is opened, air from outside the chamber flows through valve (A); through the input Vol-O-Flo element, indicating the amount of air flow on the INPUT FLOW manometer (2); and through the INPUT port (22) into the chamber.

2. The VACUUM CONTROL valve (B1) on Model 1172AS100 allows direct evacuation of the altitude chamber to the desired simulated altitude by decreasing pressure in this chamber.

3. The OUTPUT valve (C), when opened, draws a direct flow from the item under test through the Piezometer (26), OUTPUT port (23), FLOW SELECTOR valve (M) and the output Vol-O-Flo element to the vacuum pump. As the flow passes through the output Vol-O-Flo, the pressure is displayed on the OUTPUT FLOW manometer (1).

4. The LEAKAGE CONTROL valve (E) controls the flow to the LOW-PRESSURE connection (19) which is located inside the chamber. As the name of the valve implies, it is used to perform various leak tests on oxygen components. When you use the LEAKAGE CONTROL valve (E) to perform leakage tests on components, a line with bayonet fittings must be installed between the LOW-PRESSURE connection (19) and the REFERENCE-TAP connection (21). This allows the flow passing through valve (E) to be indicated on PRESSURE/ SUCTION manometer (4) or Hg manometer (5) whichever you have selected. Any leakage would be registered on rotameters (7) or (8).

5. The VENT PRESSURE valve (H) controls a vent flow of low pressure through the suit simulator tank to the item under test at sea level. When valve (H) is opened, nitrogen (N_2) flows through the vent flow Vol-O-Flo element, and is indicated on VENT FLOW manometer (3). The flow then passes to the suit simulator tank, through FLOW SELECTOR valve (M), OUTPUT connection (23) and Piezometer (26) to the item under test. Valve (H) is primarily used for testing relief valves.

6. The VENT AMBIENT valve (I) serves the same purpose as VENT PRESSURE valve (H), except that valve (H) is used at sea level with supply pressure, while valve (I) is used at altitude and uses ambient air as the pressure source to conserve N_2. Therefore, valve (I) can be considered an economizer valve, used only "at altitude".

Nonmeasuring Control Valves

The nonmeasuring valves are opened only as much as necessary. Flow through them cannot be measured or gaged. The nonmeasuring valves are:

1. The FLUTTER DAMPENER valve (J) allows an opening from the suit simulator tank to the line connecting FLOW SELECTOR valve (M) and OUTPUT valve (C). It acts as a dampener to prevent fluttering of specific regulator diaphragms during testing, and allows a flow to be drawn from a test item through the suit simulator tank when FLOW SELECTOR valve (M) is in the CONTROLLER position.

2. The CHAMBER BLEED valve (K) is used to bring the chamber to sea level from a simulated altitude.

3. The SYSTEM BLEED valve (S) is used to bleed N_2 pressure from systems of the test stand through SYSTEM BLEED port (16). On later configurations of Model 1172AS100, SYSTEM BLEED port (16) has been deleted. N_2 pressure is bled directly from a port incorporated in the SYSTEM BLEED valve (S).

SHUTOFF VALVES

Suit Simulator Reference Shutoff Valve (R)

There is only one shutoff valve on the 1172AS100 Test Stand. It is the SUIT SIMULATOR REFERENCE SHUTOFF valve (R). It is used to prevent damage to other components. The SUIT SIMULATOR REFERENCE SHUTOFF valve shuts off the suit simulator tank from REFERENCE PRESSURE SELECTOR valve (O) and HELMET REFERENCE TAP (24). When you use a shutoff valve you should fully open the valve and then turn it back 1/4 of a turn.

CAUTION

> If SUIT SIMULATOR valve (R) is left open with REFERENCE PRESSURE SELECTOR valve (O) in the suit simulator tank position, damage could occur to LOW RANGE ALTM (13) if excessive pressure is applied to it with VENT PRESSURE valve (H).

REGULATORS

There are two regulators on the 1172AS100 test stand. They control the supply pressure to the specific system being utilized. The regulators are as follows:

1. The HIGH PRESSURE REGULATOR (Q) which is pneumatically operated. It supplies regulated high pressures from 250 pounds per square inch, gage (psig) to the maximum capacity of the supply cylinder being used. Regulator (Q) has three positions; LOAD, NEUTRAL, and VENT. It is spring loaded in the NEUTRAL position. Pressure being loaded is indicated on REGULATED HIGH PRESSURE gage (10).

2. The LOW PRESSURE REGULATOR (N) which is mechanically operated, supplies regulated low pressure to the item under test, the in-system rotameters and the suit simulator tank. Regulator (N) has a range of 0 to 180 psig. The pressure being loaded is displayed on REGULATED LOW PRESSURE gage (11), and is also displayed on N_2 INPUT gage (27) when the INLET PRESSURE ON/OFF valve (L) is in the ON position.

GAGES AND INDICATORS

Gages and indicators incorporated in the test stand indicate pressures or flows. Some indicate in pounds per square inch, gage (psig), some in feet, inches of mercury (in. Hg), millimeters of mercury (mm Hg), inches of water (in. H_2O), or cubic centimeters per minute (CCM). Their functions are self explanatory.

1. The SUPPLY PRESSURE gage (9) is a 0 to 3000 psig gage and indicates supply cylinder pressure.
2. The REGULATED HIGH PRESSURE gage (10) is a 0 to 3000 psig gage and indicates regulated high pressure.
3. The REGULATED LOW PRESSURE gage (11) is a 0 to 200 psig gage and indicates regulated low pressure.
4. The INPUT PRESSURE gage (27) is a 0 to 160 psig gage and indicates regulated low pressure.
5. The LOW RANGE ALTM (13) measures chamber altitude pressure and, under some circumstances, suit simulator tank pressure. It measures pressures equivalent to altitudes between 10,000 and 40,000 feet.
6. The HIGH RANGE ALTM (12) measures chamber altitude pressure to indicate the altitude range equivalent to between 30,000 and 150,000 feet.

NOTE: Each altimeter incorporates an inner scale which indicates altitude in mm Hg instead of in feet.

7. The PRESSURE/SUCTION manometer (4) has a range of -12.0 to $+26.0$ in. H_2O, and measures the amount of differential pressure between Piezometer (26) and the altitude chamber, or between the Piezometer and the suit simulator tank. It is used during component testing to measure safety pressure and pressure breathing pressures being delivered by the component and to measure suction flows being drawn through the component.
8. The Hg manometer (5) has a range of 0 to 12.0 in. Hg and measures, in in. Hg, the amount of differential pressure between Piezometer (26) and the altitude chamber, or between the Piezometer and the suit simulator tank. It is used to measure resistance in an item under test.

NOTE: The rotameters used on the test stand are of the variable area type, which means they get progressively larger toward the top, allowing more nitrogen to pass around the ball. The point at which the ball stabilizes is known as the point of dynamic balance. Readings are made across the center of the ball.

9. The OVERBOARD LEAKAGE rotameter (6) has a range of 20 to 200 CCM (1000 CCM = 1 lpm) and is vented to ambient. It measures leakage, or bleed from an item under test. This rotameter is calibrated at 14.7 psig at 70°F (ambient air).
10. The LOW RANGE LEAKAGE rotameter (7) has a range of 20 to 200 CCM, and is enclosed in the low pressure system. It measures leakage, or bleed, from a component under test through LEAKAGE CONTROL valve (E), or

LEAKAGE ON/OFF valve (G). This rotameter is calibrated with nitrogen at 70 psig at 70 °F.

11. The HIGH RANGE LEAKAGE rotameter (8) has a range of 200 to 2000 CCM. Its function is the same as LOW RANGE LEAKAGE rotameter (7). This rotameter is calibrated at 70 psig at 70 °F.

12. The OUTPUT FLOW manometer (1) has a range of 0 to 12.0 in. H_2O. It indicates the amount of output flow from the item under test.

13. The INPUT FLOW manometer (2) has a range of 0 to 12.0 in. H_2O. It indicates the amount of ambient air flowing into the altitude chamber.

14. The VENT FLOW manometer (L3) has a range of 0 to 12.0 in. H_2O. It indicates the amount of supply pressure or ambient air to the suit simulator tank.

TEST STAND CONNECTIONS

Several connections are incorporated in the test stand for supplying and bleeding pressure to and from the system. These connections are:

1. The N_2 INPUT connector (15) is the N_2 supply cylinder connection.

NOTE: The SYSTEM BLEED port (16) has been deleted on later configurations of Model 1172AS100 Test Stands.

2. The SYSTEM BLEED port (16) bleeds pressure from the various systems.

3. The N_2 INPUT connection (18) is provided for components that require inlet pressures. Either regulated high or regulated low pressures can be provided to the connection. The N_2 INPUT tee connection (28), N_2 INPUT PRESSURE gage (27) and the gage guard that protects the input pressure gage are connected to N_2 INPUT connection (18).

CHECK VALVE CONNECTIONS

There are four connections located within the altitude chamber that have check valves incorporated, and require insertion of a bayonet-type fitting to open the connection and route the flow. These connections are:

1. The LOW PRESSURE connection (19) provides for a controlled flow of low pressure nitrogen through LEAKAGE CONTROL valve (E) to the item under test.

2. The 20 to 200 CCM LEAKAGE connection (20) connects the test item to OVERBOARD LEAKAGE rotameter (6) and is used when testing components for leakage or bleed.

3. The REFERENCE TAP connection (21) is a reference tap to differential pressure indicating manometers (PRESSURE/SUCTION manometer (4) and Hg manometer (5)). It also has a reference line that connects Piezometer (26) into REFERENCE TAP connection (21) downstream from the check valve.

4. The HELMET REFERENCE TAP connection (24) is a reference tap connected to both suit simulator tank through SUIT SIMULATOR REFERENCE SHUTOFF valve (R) or LOW RANGE ALTM (13) through REFERENCE PRESSURE SELECTOR valve (O).

NOTE: The CHAMBER REFERENCE port (N/N), also located within the chamber, references chamber pressure to ALT CONTROLLER (B), PRESSURE/SUCTION manometer (4), Hg manometer (5), LOW RANGE ALTM (13) and HIGH RANGE ALTM (12).

Line traps, float check valves, and relief valves are not shown in figure 10-1.

Line traps are incorporated in PRESSURE/SUCTION manometer (4) and Hg manometer (5) to trap liquids in case manometers are overloaded.

The float check valves incorporated in the OUTPUT FLOW manometer (1), the INPUT FLOW manometer (2), the VENT FLOW manometer (3) and the PRESSURE/SUCTION manometer (4) help to prevent a loss of liquid in case the manometers are overloaded.

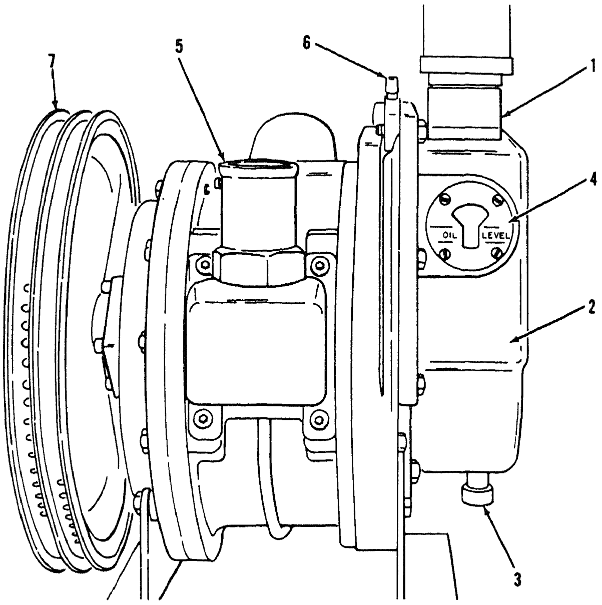
The relief valves are incorporated in the REGULATED LOW PRESSURE gage (11) and the suit simulator tank. The relief valve on the REGULATED LOW PRESSURE gage (11) is preset at 200 to 230 psig and protects the gage and rotameter system in case of gage guard failure. The PRIMARY relief valve is preset at 15 psig and the SECONDARY relief valve is preset at 25 psig. These relief valves prevent overpressurization of the suit simulator tank.

VACUUM PUMP

The VACUUM PUMP (VP) operates from a 2 horsepower electric motor (figure 10-3). The pump rotation is clockwise, when viewed from the rear of the test stand. The pump has the capability of evacuating the chamber at a rate of 22.5 cubic feet per minute (cfm) at 81 mm Hg (51,600 feet) simulated altitude. It is used to evacuate the chamber or draw a flow of air, nitrogen, or air and nitrogen from an item under test. The VACUUM PUMP vent (54) must be opened one to two turns when you operate the pump (figure 10-1).

WARNING

Always ensure that the pump motor has a four-prong electrical connection plug. On Model 1172AS100 ensure that the grounding lug is in place and securely connected. A side view of the vacuum pump is shown in figure 10-3.



1. OIL FILL PORT (FILTER ON TOP)
2. OIL CASE COVER
3. OIL DRAIN CAP
4. OIL COVER WINDOW, (SIGHT GAGE)
5. INTAKE NIPPLE
6. VACUUM PUMP VENT
7. BELT PULLEY

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Figure 10-3.—Vacuum pump.

SAFETY PRECAUTIONS

Before you attempt to operate the test stand, review the following safety precautions. These safety precautions must be observed before, during and after test stand operation.

1. Ensure that the test stand is properly secured prior to opening the supply cylinder valve. Position the HIGH PRESSURE REGULATOR (Q) to LOAD, then to VENT, and ensure that the LOW PRESSURE REGULATOR (N) is backed out and the other valves are turned fully to the right.

2. Keep the chamber door closed whenever possible.

3. Keep the test stand doors closed at all times.

4. Keep the test stand work tray closed when it is not in use.

5. Check the pump lubricant prior to turning the pump on (run for 2 minutes and check lubricant for proper level).

6. Keep your hands and head clear of belts and pulleys while checking the lubricant level.

7. Ensure the test stand is properly grounded by using the grounding lug.

8. Never use regulated high pressure and regulated low pressure together.

9. When the Oxygen Monitor alarm sounds, leave the room.

10. Do not panic when the test stand malfunctions.

11. When you use nitrogen, ensure that the room is well ventilated.

12. Use proper tools for the job you are performing.

13. Do not inhale lubricant, oxygen cleaning compound, or mercury fumes.

14. Wash pump lubricant or mercury from hands immediately.

15. Secure the test stand completely after use.

15. Never leave the test stand unattended while the pump is running.

17. When transporting the compressed nitrogen cylinder, you should ensure the protective cap is on.

MAINTENANCE

MANOMETER PREPARATION

Maintenance on the 1172AS100 begins as soon as the test stand is uncrated. You should fill the OUTPUT (1) INPUT (2) and VENT FLOW (3) manometers with a liquid that has a known specific gravity of 1.0. The liquid used for the 1172AS100 is a mixture of one part concentrated green manometer fluid (merian D-2930) mixed with 10 parts of distilled water. To fill the manometers, your first step is to adjust the scale so that the zero is located half way between the full-up and the full-down position.

Remove the fill plugs from the manometer reservoirs and fill the reservoir until the fluid reaches the zero mark on the scale. After you have filled the reservoir to zero replace the fill plugs.

To fill the Pressure Suction manometer with fluid, use red manometer fluid with a specific gravity of 1.9. The procedure is the same. Adjust the scale so the zero mark is half way between full-up and full-down. You have one more type manometer to fill. The Hg manometer uses triple-distilled mercury. To fill this manometer, follow the same procedure that you used for the other manometers. Do not spill the mercury. If you do, notify your supervisor, and follow the special precautions for cleaning mercury spills.

PRESSURE/LEAKAGE TESTS

In order to ensure maximum operating efficiency, Pressure/Leakage Tests must be performed periodically.

NOTE: Use systems schematic drawings as an aid in determining any malfunctions that may exist. You can find these schematics in the NAVAIR 13-1-6-4.

Outward Leakage Test (Supply System)

The outward leakage test is performed as follows:

1. Ensure the supply cylinder valve and all test stand valves are closed.
2. Open fully, then close the supply cylinder valve.
3. Note the pressure registered on gage (9). After 2 minutes, reread the pressure on gage (9). There should be no pressure drop (a drop in pressure indicates leakage).

Outward Leakage Test (Regulated High Pressure System)

The outward leakage test is performed as follows:

1. Cap connection (18) in chamber.
2. Open supply cylinder valve.
3. Turn regulator (Q) to LOAD, and hold until 2000 psig (or cylinder pressure) is indicated on gage (10). (Gage (11) should indicate the gage guard cut-off pressure, 170 ± 5 psig.)
4. Close the supply cylinder valve and note the pressure on gage (10). After 2 minutes, reread gage (10). There should be no pressure drop (a drop in pressure indicates leakage).

NOTE: If pressure is registered on gage (27), a leak is indicated in ON/OFF valve (L) or ON/OFF valve (G). A pressure drop on gage (11) also indicates valve (G) is leaking. (Valve (G) will be independently tested later.)

Bleed pressure by turning (Q) to VENT. Open valve (S) to bleed system, then close valve (S).

Outward Leakage Test (Regulated Low Pressure System)

The outward leakage test is performed as follows:

1. Open the supply cylinder valve. Turn the selector valve (F) to HIGH and the selector valve (D) to Hg.
2. Turn the ON/OFF valves (L) and (G) to ON.
3. Slowly turn the regulator (N) clockwise until 70 psig is indicated on gages (11) and (27).
4. Return valve (L) to OFF and observe rotameter (8). Any leakage will be indicated by the ball rising in the rotameter tube. There should be no leakage.
5. Turn valve (F) to LOW RANGE position and observe rotameter (7). There should be no leakage.
6. Return valve (F) to HIGH RANGE, and valve (L) to ON.
7. Slowly adjust the regulator (N) until 160 psig is registered on gage (11). (Gage (27) should indicate its gage guard cut-off pressure of 145 ± 5 psig.)
8. Turn the ON/OFF valve (L) to OFF and observe rotameter (8). There should be no leakage indicated.
9. Turn the selector valve (F) to LOW RANGE and observe rotameter (7). There should be no leakage indicated.
10. Decrease the pressure to 70 psig by opening valve (S), and turning regulator (N) in a counterclockwise direction.

Leakage Control Valve (E) and Leakage ON/OFF Valve (G) Tests

Perform leakage control valve and leakage ON/OFF valve tests as follows:

1. Connect a hose from connection (19) to tap (20) in the chamber, and observe rotameter (6). There should be no leakage indicated.
2. Turn the ON/OFF valve (G) to OFF and remove the cap from connection (18) in chamber.
3. Observe rotameter (7). There should be no leakage indicated.

Suit Simulator System Leakage Tests

Perform leakage tests on the suit simulator system as follows:

1. Open the shutoff valve (R) and valve (J) fully. Place the selector valve (O) to the ALT CHAMBER, and valve (M) to the suit simulator position.

2. Remove the hose from tap (20) and connect it to tap (21) (connecting connection (19) to tap (21)). Cap Piezometer (26).

3. Place selector valve (D) in the H_2O position, and valve (F) in the HIGH RANGE position.

4. Open valve (E) slowly to maintain a pressure of 10.0 in. H_2O throughout the system as indicated on manometer (4). Close valve (E). Any further climb on manometer (4) indicates a leak through valve (H).

5. Open valve (E) to maintain 20.0 in. H_2O. When pressure is constant, observe rotameter (8). There should be no leakage.

6. Turn valve (F) to LOW RANGE. The rotameter (7) should indicate no leakage.

7. Return valve (F) to HIGH RANGE, and close valve (E). Remove the hose from connection (19) and allow the pressure to escape from the hose.

NOTE: Open valve (C) to aid in relieving pressure; then close it.

8. When the pressure has equalized, connect the hose from tap (21) to tap (20) in the chamber. Rotameter (6) should show no indication of leakage.

9. Remove the cap from Piezometer (26), and disconnect the hose between taps (20) and (21) in the chamber.

10. Turn the regulator (N) counterclockwise, and open valve (S) to bleed system. Close all test stand valves with the exception of valves (R) and (J).

Altitude Chamber and Suit Simulator Tank Inward Leakage Test

Perform the altitude chamber and suit simulator tank inward leakage test as follows:

1. Place valve (D) in the Hg position. Ensure the ON/OFF valves (G) and (L) are in the OFF position. Place valve (O) in the suit simulator position.

2. Close the chamber door and turn the vacuum pump motor ON.

3. Open the VACUUM CONTROL valve (B_1) and "ascend" to 30,000 feet. Close (B_1) and check to ensure that the same altitude is indicated on both altimeters (12) and (13). At 30,000 feet you will see the high-range altimeter start to climb and at 40,000 feet the low-range altimeter will no longer be in use. This happens automatically and the low-range altimeter will not be damaged.

4. Using valve (B_1) "ascend" to 40,000 feet; ensure that altimeters (12) and (13) register the same altitude.

5. Using the VACUUM CONTROL valve (B_1), ascend to 52,000 feet. (Altitude is indicated on altimeter (12).)

6. Close (B_1); after a 2-minute stabilization period, record the altitude indicated on altimeter (12). Altitude "loss" should not exceed 1000 feet in 20 minutes.

PERIODIC INSPECTIONS

Periodic Inspections consist of Daily, Weekly, Biweekly, Monthly and 6-Month Inspections. Perform these inspections at the prescribed intervals using the following procedures as applicable:

Daily Inspection

Perform the Daily Inspection as follows:

1. Check the vacuum pump lubricant for the proper level (run the pump for 2 minutes and recheck for proper level).

2. Inspect the gages and manometers for cleanliness, fogged or broken glass, and zero or normal indications.

3. Inspect the altitude chamber door for cleanliness, chips, scratches or cracks. Check the gaskets for excessive wear or deterioration.

4. Inspect the connections and adapters for cleanliness and distortion.

5. Check the identification plates for cleanliness, legibility and security of attachments.

Weekly Inspection

The Weekly Inspection shall include all the tasks of the Daily Inspection and the following additional tasks:

1. Inspect the polyethylene tubing, fittings, connections and rubber couplings for the correct fit, dirt or excessive dust, pin holes, radical bends or kinks, surface abrasions and heat blisters.

2. Inspect the gages, manometers and flowmeters for the correct calibration decals, proper fluid level, and cleanliness of manometer and flowmeter tubes.

3. Perform the pressure leakage tests in accordance with NAVAIR 3-1-6.4.

Biweekly Inspection

The Biweekly Inspection shall include all the tasks of the Weekly Inspection and the following additional tasks:

1. Inspect the pump drive belt for proper tension, pulley alignment, excessive belt wear, and tightness of pulley setscrews.

2. Perform the orifice calibration check in accordance with NAVAIR 13-1-6.4.

3. Perform the flowmeter intercomparison test in accordance with NAVAIR 13-1-6.4.

Monthly Inspection

The Monthly Inspection shall include all the tasks of the Biweekly Inspection and the following additional tasks:

1. Inspect the N_2 and air inlet connectors for dirt, foreign matter, corrosion, stripped threads and badly scarred surfaces.

2. Inspect the gaskets at bulkhead fittings and vacuum pump filters for deterioration, proper fits and alignments.
3. Inspect the copper tubing for corrosion and tightness of soldered joints.
4. Inspect the altitude chamber for cleanliness, proper fit and alignment of gaskets, excessive scratches on chamber door, leaks or corrosion at pipe fittings and wear of the door gasket.
5. Inspect all tubing and piping for tightness and proper alignment.
6. Inspect all electrical plugs, connectors and wiring for physical damage, bent pins, loose connections and security of cables.
7. Inspect all control valves for cleanliness and tightness of mounting nuts and knobs.

VOL-O-FLO CALIBRATION

The intercomparison test compares the Input and Output Vol-O-Flo elements to determine if the flowmeters need calibration. It is performed more often than the orifice calibration test as it is quicker and easier to perform.

The Orifice Calibration Check accurately determines whether the Output Vol-O-Flo is within calibration tolerances.

When a test stand fails the intercomparison test, an Orifice Calibration Check shall be performed. Failure of the intercomparison test and Orifice Calibration Check requires the removal and cleaning of the Input and Output Vol-O-Flo elements.

NOTE: Prior to performing these calibration checks, you should ensure that there is no test stand leakage.

1. After cleaning, drying and reinstallation of the Vol-O-Flo elements, both the intercomparison test and the Orifice Calibration Check must be repeated. Failure of the above tests after cleaning will require the test stand be calibrated with a master calibrator used by the metrology calibration team.

VOL-O-FLO ELEMENT CLEANING

To clean the Vol-O-Flo element proceed as follows:

1. Disconnect the tubes from Vol-O-Flo manometers.

NOTE: Prior to removal of the element, mark the direction of the flow to ensure proper reinstallation.

2. Disconnect the element from the plumbing system by removing the hose and hose clamps at the ends of the element.
3. Mix a cleaning solution of 4 percent liquid detergent and water. (Mix 6 ounces of detergent with 1 gallon of water.)
4. Flush the element in reverse from the direction in which the air normally flows.
5. After the element has been well flushed, the detergent shall be rinsed out immediately with clean water.
6. Install the element in the test stand and create a flow through the element for approximately 1 hour to ensure that it is completely dry.
7. After the element is dried, the test stand is leak-tested.
8. Perform an intercomparison test and orifice calibration check in accordance with the NAVAIR 13-1-6.4.

CHAPTER 11

MINIATURE OXYGEN REGULATORS

Oxygen regulators are used in all naval aircraft. They supply the aircrewman with the necessary oxygen to perform all flying duties under all kinds of conditions. As a PR you maintain, service, and test oxygen regulators. This chapter will give you a basic idea of how the model 226-20004 miniature oxygen regulator functions, and the maintenance that you must perform on it.

MINIATURE OXYGEN REGULATOR 226-20004

The miniature regulator shown in figure 11-1 is a model 226-20004 and it is manufactured by Robertshaw Controls Co. It is designed to regulate a supply of 100% pure oxygen to the aircrewman during flight. Table 11-1 contains the leading particulars for this regulator.

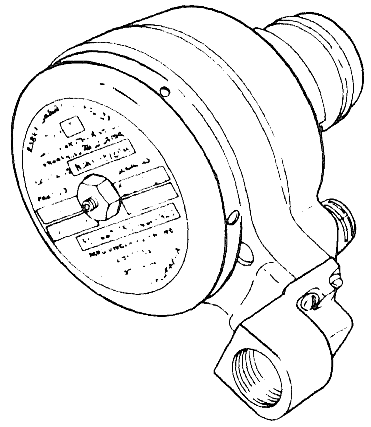

Figure 11-1.—Miniature Oxygen Breathing Regulator Models 226-20004 and 226-20004-3.

The miniature regulator reduces and regulates supply oxygen pressure to provide an adequate amount for breathing under a variety of conditions. It has a safety-pressure feature which automatically maintains a pressure in the aviator's mask of 0.65 to 2.0 inches of water above the surrounding air pressure. (Inches of water is a means of measuring the comparatively low pressure used in testing oxygen regulators.) This positive pressure is maintained at all altitudes up to and including 34,000 feet. Above that altitude the pressure-breathing feature maintains a positive pressure in the mask of up to 18.0 inches of water at altitudes between 35,000 and 50,000 feet, with the positive pressure increasing in proportion to the altitude. Miniature regulators can be used up

Table 11-1.—Leading Particulars for Miniature Oxygen Breathing Regulator Models 226-20004 and 226-20004-3

Recommended Inlet Pressure	40 to 90 psig
Flow	0 to 100 lpm
Operating Altitude Range	0 to 50,000 feet
Operating Temperature Range	−65°F to +160°F
Weight	2.3 ounces

WARNING

At no time shall operational altitude exceed 50,000 feet.

to approximately 50,000 feet. However, due to human limitations, miniature regulators shall not be used above 43,000 feet except for very short periods.

FUNCTION

The miniature oxygen regulator operates on an inlet pressure of 40 to 90 psig. This pressure enters the regulator through a filter in the inlet fitting and flows into the inlet body. (Refer to figure 11-2.) It then follows three passages; to the aneroid bleed, to the main valve, and to the inlet orifice (0.008-inch passage). Oxygen flowing through the inlet orifice flows directly to the back side of the main (demand) valve and into an anti-surge chamber. From this area the oxygen takes another passage (0.0135-inch passage) leading directly to the pilot valve.

During normal operation, the safety pressure spring exerts pressure on the sensing diaphragm and the paddle assembly. This pressure overcomes the spring tension on the paddle assembly, allowing the paddle to move down and unseat

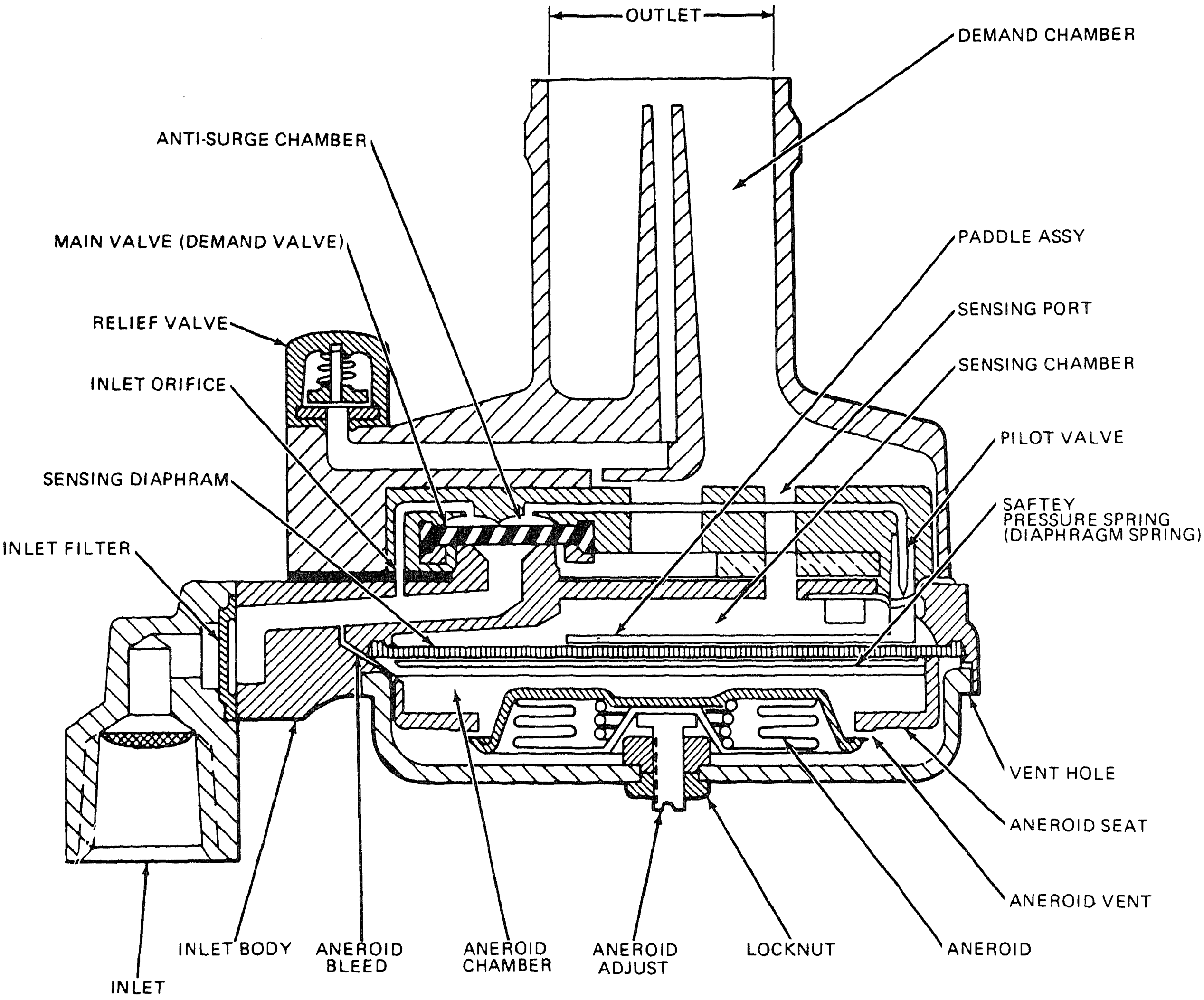

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Figure 11-2.—Regulator Schematic.

the pilot valve. This allows oxygen to escape into the sensing chamber.

Oxygen will pass through the pilot valve faster than it can be replaced on the back side of the main (demand) valve through the inlet orifice. This creates a pressure buildup in the sensing chamber, and a pressure drop on the back side of the main (demand) valve which causes it to unseat, giving system oxygen a path of least resistance. The system oxygen then flows to the demand chamber at the outlet adapter and to the user.

The pressure drop in the sensing chamber allows the safety pressure spring to move the sensing diaphragm in the direction of the pressure drop, keeping the pilot valve unseated. By exhaling, the aircrewman causes the valve in the oxygen mask to seat, allowing the oxygen pressure to build up in the demand chamber. This pressure, being sensed through the sensing port, overcomes the pressure being exerted by the safety pressure spring on the sensing diaphragm, causing the pilot valve to seat.

Once the pilot valve seats, pressure builds up on the back side of the main (demand) valve, causing it to seat and stopping the flow of oxygen to the user.

Pressure breathing capability is provided by an aneroid, aneroid seat, aneroid bleed and sensing diaphragm. A constant oxygen bleed of 100-150 cubic centimeters per minute (ccm*) is directed to the aneroid chamber. At altitudes below pressure breathing altitude, this bleed is vented to the outside through vent holes in the aneroid cover. As altitude increases, the aneroid expands, and comes in contact with the aneroid seat, limiting the amount of venting.

When venting is limited it causes a pressure buildup in the aneroid chamber, causing the sensing diaphragm to balloon, making contact with the paddle assembly, thus opening the pilot valve and allowing oxygen to flow to the user.

Oxygen flows until enough pressure is built up in the sensing chamber during exhalation to overcome pressure in the aneroid chamber. Remember, the bleed into this chamber is always constant. The aneroid only limits the amount of oxygen being vented out of it.

The relief valve serves as a maximum pressure control device. It must maintain pressure at 14.0 to 18.0 in. H_2O at the regulator outlet.

MAINTENANCE

Here are the procedural steps for inspecting, testing, troubleshooting, cleaning, and adjusting the Robertshaw Miniature Oxygen Regulator Models 226-20004 and 226-20004-3.

NOTES

1. The regulator is beyond economical repair when the cost of repair parts exceeds approximately 75 percent of the cost of the regulator.
2. Whenever any repair or replacement of parts is made to a regulator, a corresponding entry shall be made on the Aircrew Personal Equipment History Card for that regulator.

The Model 226-20004 and 226-20004-3 miniature regulators shall not be scheduled into Depot Maintenance. Major repair of these regulators is not authorized. Minor repairs and testing are done at the Intermediate Maintenance level. Minor repairs include replacement of worn, defective, or otherwise damaged parts with available replacement component parts. Minor repairs to component parts (chasing crossed or slightly damaged threads or smoothing of slight burrs) is authorized where such repair does not cause leakage.

The miniature regulator shall remain in service for as long as it continues to function correctly and does not require excessive repair. All silicone rubber parts shall be replaced routinely whenever a regulator is disassembled.

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*The proper abbreviation for this is ml/min, but ccm is commonly used in your technical publications so we use it in this text.

The following tests and inspections are listed under the inspection cycle in which they are required, and are further listed in the sequence in which they normally occur.

DAILY/PREFLIGHT INSPECTIONS

The Daily/Preflight Inspection is a visual type inspection performed by the aircrewman to whom the regulator is issued, daily or prior to each flight. To perform this inspection, visually inspect the following:

WARNING

> When working with oxygen, make certain that clothing, tubing fittings, and equipment are free of oil, grease, fuel, hydraulic fluid, or any combustible materials. Fire or explosion may result when even slight traces of combustible material come in contact with oxygen under pressure.

Inlet and outlet connections for security of attachment. Ensure all clamps, locknuts and fittings are tight.

Regulator body for bends, dents, scratches, corrosion, condition of nameplate, cracks or any other damage.

Perform a functional test as outlined in the next inspection (special inspections).

If discrepancies are found or suspected, the regulator shall be taken to the Aviator's Equipment Branch for the required corrective maintenance action.

SPECIAL INSPECTIONS

Special Inspections are required at specified intervals other than daily/preflight or calendar inspections. The interval for miniature oxygen regulators is 30 days. This inspection consists of a visual type inspection and a functional test, both performed by personnel of the Aviator's Equipment Branch. To perform the Special Inspection, proceed as follows:

Visually inspect the regulator as outlined in the daily inspection.

Functionally test the miniature regulator by attaching the mask, regulator and hose assembly to a suitable oxygen supply source.

Turn the supply source on. There should be a flow of oxygen through the mask.

Don mask and breathe. There should be a slight resistance on exhalation. This resistance during exhalation is due to positive pressure feature of the regulator.

When you finish the Special Inspection, record the date and place of inspection in the "Notes" section of the Aircrew Personal Protective Equipment History Card.

CALENDAR INSPECTION

The Calendar Inspection shall be performed on all miniature regulators upon issue prior to being installed in an in-service personal oxygen configuration, and shall be performed on all miniature regulators in service at least every 91 days.

The Calendar Inspection consists of a visual type inspection and a bench test. All work shall be performed in a clean, dust-free and oil-free area. A miniature regulator found to be defective or damaged shall be repaired by replacing the damaged part or parts. After repair, repeat the bench test.

Visual Inspection

To visually inspect the miniature regulator, proceed as follows:

Disconnect the communication connectors.

Loosen the hose clamp securing the regulator outlet to the mask delivery hose, and remove the regulator from the hose. Retain the hose clamp. The regulator inlet fitting must be held firmly in a vise while removing regulator-to-seat kit hose. Failure to do so could result in damage to inlet retaining screws, causing partial or total loss of inlet pressure due to leakage.

Loosen the locknut and remove the regulator-to-seat kit hose from the regulator inlet.

Inspect the regulator inlet and outlet for foreign objects, dirt, corrosion, bends, dents, cracks and other damage. Ensure the regulator inlet filter is properly installed.

Inspect the regulator body for bends, dents, cracks, corrosion, condition of nameplate, security of screws and fittings and for other obvious damage.

Inspect the inlet fitting for presence of Glyptal on head of retaining screws. If screws are loose, or Glyptal is not evident, you will need to check the screws for presence of sealing compound and retighten them.

To apply the sealing compound remove the screw and apply sealing compound (MIL-S-22473 Grade B or Grade EV) to the threaded portion of the inlet screw.

Insert the coated screws and tighten each one. Apply a small dab of Glyptal paint to the top of each screw head to indicate that sealing compound has been applied to the screw threads.

Miniature regulators failing the visual inspection or the bench test shall be repaired, if specific repair is authorized. SM & R Codes contained in NAVAIR 13-1-6.4 define repairable components and level of maintenance authorized for repair. Further explanation is contained in the Naval Aviation Maintenance Program Manual, OPNAVINST 4790.2 (Series).

Bench Test

The Bench Test and all other tests shall be performed using an Oxygen System Components Test Stand, Model 1172AS100. Refer to Chapter 10 of this training manual for identification of test stand controls and indicators referred to in the bench test procedures that follow. Do not attempt to perform any bench test before becoming thoroughly familiar with the test stand. Utilize a Performance Test Sheet when performing the bench test. See figure 11-3.

BODY LEAKAGE TEST.—To perform the Body Leakage Test, proceed as follows:

WARNING

Because of possible vacuum pump explosion, only water-pumped nitrogen, Type 1, Class 1, Grade A conforming to Fed. Spec. BB-N-411 shall be used in testing oxygen regulators. These N_2 cylinders are painted gray and identified by two 3 inch black bands painted around the top of the cylinders.

Place a cap on the regulator inlet.

Attach the regulator outlet to the short hose attached to Piezometer in the chamber. Ensure all test stand valves are in the secured position, then open the N_2 supply cylinder valve. Ensure the regulator outlet and the Piezometer are one inch apart.

Using the hose supplied with test stand, connect the LOW PRESSURE connection to the REFERENCE. Tap connection in the chamber.

Adjust the LOW PRESSURE REGULATOR so that the REGULATED LOW PRESSURE gage indicates 70 psig. When flows are drawn through the in-system leakage rotameters, an inlet pressure of 70 psig will normally be used, as this is the pressure used to calibrate the rotameters.

Turn the LEAKAGE SELECTOR valve to its LOW position.

If pressure is indicated on the HG manometer, open the OUTPUT valve (C) to relieve the pressure. Then, slowly turn the PRESSURE SELECTOR valve to the H_2O position.

REGULATOR PERFORMANCE TEST SHEET

ROBERTSHAW CONTROLS REGULATOR
MODEL 226-20004 and 226-20004-3

DATE: ____________ REGULATOR SERIAL NO: __________ TEST STAND SERIAL NO: __________

TEST STAND OPERATOR: ______________________________ CDI: ______________

1. BODY LEAKAGE TEST: 10 IN. H_2O. NO LEAKAGE ALLOWED.

2. RELIEF VALVE TEST: 200 CCM FLOW. MAINTAIN 14.0 - 18.0 IN. H_2O. __________
   20 CCM FLOW. MINIMUM 11.0 IN. H_2O. __________

3. DEMAND VALVE LEAKAGE TEST: 110 PSIG INLET PRESSURE. OUTLET PRESSURE NOT TO EXCEED 2.0 IN. H_2O IN 5 MINUTES. __________

NOTE: DO NOT USE PIEZOMETER RESTRICTOR IN PERFORMING THE FOLLOWING TESTS:

4. SAFETY PRESSURE TEST: READINGS MUST BE BETWEEN 0.65 AND 2.0 IN. H_2O.

ALTITUDE (FEET)	INLET PRESS (PSIG)	0 LPM FLOW (IN. H_2O)	READING	50 LPM FLOW (IN. H_2O)	READING	100 LPM FLOW (IN. H_2O)	READING
SEA LEVEL	50	0					
SEA LEVEL	90	0					
10,000	50	0					
10,000	90	0					
25,000	50	0					
25,000	90	0					
34,000	50	0					
34,000	90	0					

5. PRESSURE BREATHING TEST:

ALTITUDE (FEET)	INLET PRESS (PSIG)	0 LPM FLOW (IN. H_2O)	READING	100 LPM FLOW (IN. H_2O)	READING	OUTLET PRESSURE (IN. H_2O)	
						MIN	MAX
35,000	50	0				0.65	3.5
35,000	90	0					
40,000	50	0				5.3	9.4
40,000	90	0					
43,000	50	0				9.2	12.5
43,000	90	0					
50,000	50	0				14.0	18.0
50,000	90	0					

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Figure 11-3.—Regulator Peformance Test Sheet.

Table 11-2.—Troubleshooting (Body Leakage Test)

Trouble	Probable Cause	Remedy
Body leakage.	Loose adapter assembly.	Tighten screws.
	Sensing diaphragm damaged or improperly installed.	Install sensing diaphragm properly or replace.
	Loose aneroid cover.	Tighten cover assembly.
	Insufficient squeeze on main gasket.	Tighten cap screws.
	Damaged main gasket.	Replace gasket.
	Weak relief valve spring.	Replace spring.
	Loose inlet fitting.	Tighten screws.
	Inlet gasket too thin or damaged.	Replace gasket.
	Inlet filter improperly installed.	Reinstall inlet filler properly.

Slowly open the LEAKAGE CONTROL valve until it reaches 10.0 in. H_2O pressure to the regulator outlet, as indicated on the PRESSURE/SUCTION manometer.

Leakage will be indicated on the LOW RANGE LEAKAGE rotameter. There shall be no leakage if the regulator is operating satisfactorily.

If leakage is indicated, refer to table 11-2, troubleshooting chart, for probable causes and remedies.

Close the LEAKAGE CONTROL valve.

Leave the position of all controls and connections unchanged, and continue on to the Relief Valve Test.

WARNING

Never block the outlet of the miniature regulator, such as by cupping the hand over its outlet pipe, while a pressure is applied to the inlet. This will seriously damage the automatic pressure breathing mechanism of the regulator. The resulting damage will be undetectable and may cause serious injury or loss of life.

RELIEF VALVE TEST.—To test the Relief Valve, proceed as follows:

Slowly open the LEAKAGE CONTROL valve until 200 ccm flow is indicated on the LOW RANGE LEAKAGE rotameter.

The PRESSURE/SUCTION manometer must be indicating between 14.0 and 18.0 in. H_2O. Enter the reading on the Performance Test Sheet.

Close the LEAKAGE CONTROL valve until 20 ccm is indicated on the rotameter. Outlet pressure, indicated on the PRESSURE/SUCTION manometer, shall not drop below 11.0 in. H_2O. Enter the results on the Performance Test Sheet.

Close the LEAKAGE CONTROL valve.

Table 11-3.—Troubleshooting (Relief Valve Test)

Trouble	Probable Cause	Remedy
Relief valve fails to reach 14 inches of water or leaks excessively.	Relief valve spring too weak.	Replace spring.
	Relief valve parts dirty or damaged.	Clean or replace poppet or seat.
	Leak at the relief valve gasket.	Tighten screws or replace gasket.
	Pin holes in sensing diaphragm.	Replace diaphragm.
	Leak between main gasket and outlet adapter.	Tighten screws or replace gasket.
Relief valve cracks above maximum pressure of 18 inches of water.	Relief valve spring too strong.	Replace spring.
	Relief valve parts magnetized.	Demagnetize parts.
	Relief valve parts dirty and stick together.	Clean parts.

If malfunctions were noted, refer to table 11-3, troubleshooting chart, for probable causes and remedies.

DEMAND VALVE LEAKAGE TEST.—To test the Demand Valve for leakage, proceed as follows:

Disconnect the hose from the LOW PRESSURE connection and the REFERENCE tap in the altitude chamber.

Uncap the regulator inlet and connect it to the N_2 INPUT connection in the altitude chamber.

Place the PRESSURE SELECTOR valve in the HG position and turn the vacuum pump on.

Turn the INLET PRESSURE ON/OFF valve to ON slowly.

Using the LOW PRESSURE REGULATOR, apply 110 psig to the regulator inlet. Pressure will be indicated on the N_2 INPUT PRESSURE gage.

Open the OUTPUT valve slightly to draw a flow through the regulator, then close it.

Place the PRESSURE SELECTOR valve in its H_2O position.

Observe the PRESSURE/SUCTION manometer for 5 minutes. Pressure must not exceed 2.0 in. H_2O. After the 5-minute period, read the manometer and enter the reading in the appropriate block on the Performance Test Sheet.

If leakage is excessive, locate the probable cause using troubleshooting chart, table 11-4.

SAFETY PRESSURE TEST.—To perform the Safety Pressure Test, you will be required to secure the glass door on the vacuum chamber. Ensure that the door is secured tightly.

1. Adjust the LOW PRESSURE REGULATOR to 50 psig as indicated on the N_2 INPUT PRESSURE gage. If at any time during this test the regulator causes fluid in the PRESSURE/SUCTION manometer to flutter,

Table 11-4.—Troubleshooting (Demand Valve Leakage Test)

Trouble	Probable Cause	Remedy
Demand valve leakage.	Improper adjustment of paddle assembly.	Adjust paddle assembly.
	Damaged pilot valve seat.	Replace regulator valve body subassembly.
	Damaged pilot valve flap.	Replace pilot valve flap.
	Leak at base of pilot valve.	Apply Loctite or replace inlet body subassembly.
	Damaged demand valve diaphragm.	Replace diaphragm.
	Damaged demand valve seat.	Replace inlet body subassembly.
	Damaged demand valve cavity.	Replace adapter assembly.
	Loose or damaged main gasket.	Tighten screws or replace gasket.
	Expanded aneroid.	Replace aneroid assembly.
	Porosity in body subassembly.	Replace body subassembly.

open the FLUTTER DAMPENER valve slowly until the flutter is eliminated. If at "altitude," descend to "sea level" prior to opening the FLUTTER DAMPENER valve as PRESSURE/SUCTION manometer can be easily overloaded. When "ascending to altitude" with the valve open, maintain an output flow reading of 6.0 in. H_2O. When increasing flows, the inlet pressure must be adjusted to maintain the correct inlet pressure.

2. When the inlet pressure is steady on 50 psig and with the OUTPUT valve closed, read the PRESS./SUCTION manometer and enter the reading in the appropriate block on the Performance Test Sheet.

3. Adjust the OUTPUT valve to the equivalent of 50 lpm and then 100 lpm as indicated on the OUTPUT manometer. Read the safety pressure indicated on the PRESSURE/SUCTION manometer and enter this figure on the Performance Test Sheet. The safety pressure shall be not less than 0.65 in. H_20 nor greater than 2.0 in. H_2O for all flows.

4. Increase the inlet pressure to 90 psig and repeat the Safety Pressure Test for flow rates of 0, 50, and 100 liters per minute. Enter the readings in the appropriate blocks on the Performance Test Sheet. Safety pressure shall be not less than 0.65, nor more than 2.0 in. H_2O for all flows.

5. Ensure the REFERENCE PRESSURE SELECTOR valve is in the ALTITUDE CHAMBER position. Close and lock the altitude chamber door. You are now ready to ascend in altitude.

Table 11-5.—Troubleshooting (Safety Pressure Test)

Trouble	Probable Cause	Remedy
Over aspiration at high safety pressure flow.	Main gasket too thick or loose gasket assembly.	Install thinner main gasket or tighten screws.
Negative safety pressure and insufficient flow.	Inlet filter clogged.	Replace filter.
	Paddle assembly improperly adjusted.	Readjust paddle asssembly.
	Safety pressure spring too weak.	Bend spring to increase tension.
	Too much squeeze on demand valve diaphragm.	Install thicker main gasket.
	Sensing orifice oversize, or restricted.	Replace orifice.
	Flutter, or chugging.	Dial out with FLUTTER DAMPENER valve.

6. Open the OUTPUT valve and draw a flow reading of 3.0 in. H_2O through the regulator. Flow will be indicated on the OUTPUT FLOW manometer. Remember when the Flutter Dampener valve is open, you must maintain a 6.0 in. H_20 FLOW.

7. If you are using the MODEL 1172AS100 TEST STAND, slowly open the VACUUM CONTROL valve and observe the PRESSURE/SUCTION manometer. If a rapid increase in pressure is indicated, close down the VACUUM CONTROL valve until pressure stabilizes. This rapid increase of pressure is caused by too fast a rate of climb in the altitude chamber.

Using VACUUM CONTROL valve, ascend to 10,000 feet as indicated on LOW RANGE ALTIMETER (13) and repeat steps 1 through 4. If the altitude chamber pressure is inadvertently taken above test altitudes, open the CHAMBER BLEED valve slowly and descend to the desired altitude. Then close the valve.

Next, using the VACUUM CONTROL valve "ascend" to 25,000 feet as indicated on the LOW RANGE ALTIMETER and repeat steps 1 through 4.

By using the VACUUM CONTROL valve ascend to 34,000 feet. This altitude will be indicated on the LOW RANGE ALTIMETER (13). Perform steps 1 through 4 again.

If malfunctions were noted, locate the probable cause using the troubleshooting chart, table 11-5.

Leave the position of all controls and connections unchanged, and go on to make the Pressure Breathing Test.

PRESSURE BREATHING TEST.—To perform the Pressure Breathing Test, proceed as follows:

Open the OUTPUT valve and draw a flow of 3.0 in. H_2O through the regulator (6.0 in. H_2O if the FLUTTER DAMPENER valve is open). Using the VACUUM CONTROL valve, "ascend" to 35,000 feet.

Using the LOW PRESSURE REGULATOR, adjust the inlet pressure to 50 psig. Close the OUTPUT valve and read the PRESSURE/SUCTION manometer. The reading shall be between 0.65 and 3.5 in. H_2O. Enter the reading on the Performance Test Sheet.

Adjust the OUTPUT valve to a flow of 100 lpm*, and read the PRESSURE/SUCTION manometer. This reading shall be between 0.65 and 3.5 in. H_20. Enter it on the Performance Test Sheet.

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*This abbreviation is used in your current technical manuals for this equipment. The correct abbreviation for liters per minute is L/min, and will probably be used in future publications.

Table 11-6.—Troubleshooting (Pressure Breathing Test)

Trouble	Probable Cause	Remedy
Low or no pressure breathing.	Aneroid improperly adjusted.	Turn aneroid clockwise.
	Aneroid or aneroid seat damaged or dirty.	Clean, relap or replace aneroid or aneriod seat.
	Aneroid bleed setting too low.	Readjust aneroid bleed to 100 to 150 ccm with bleed screw.
	Bleed leaking externally instead of into aneroid chamber.	1. Replace sensing diaphragm.
		2. Tighten aneroid cover.
		3. Replace aneroid seat.
High pressure breathing.	Aneroid improperly adjusted.	Turn aneroid counterclockwise.
	Aneroid expanded.	Replace aneroid.
	Bleed setting too high.	Readjust bleed to 100 to 150 ccm with bleed screw.
Wide range between pressure-breathing at 50 and 90 psig input pressure.	Aneroid or aneroid seat dirty or damaged.	Clean, relap or replace aneroid or aneroid seat.
	Bleed setting too low.	Readjust bleed to 100 to 150 ccm with bleed screw.
	Regulator fluttering.	Dial out with FLUTTER DAMPENER valve (J).
Excesssive pressure drop from 0 to 100 lpm flow.	Regulator fluttering.	Dial out with FLUTTER DAMPENER valve (J).
	Inlet filter clogged.	Replace inlet filter.
	Aneroid or aneroid seat dirty or damaged.	Clean, relap or replace aneroid or aneroid seat.
Difficulty in setting aneroid as evidenced by erratic readings.	Aneroid or aneroid seat dirty or damaged.	Clean, relap or replace aneroid or aneroid seat.
	Aneroid excessively eccentric to screw.	Replace aneroid.
	Aneroid screw not perpendicular to aneroid.	Replace aneroid.

Repeat these procedures at test altitudes of 40,000, 43,000, and 50,000 feet. The proper readings on the PRESSURE/SUCTION manometer should be 5.3-9.4 in. H_2O at 40,000 feet, 9.2-12.2 in. H_2O at 43,000 feet, and 14.0-18.0 in. H_2O at 50,000 feet. If any malfunctions were noted, refer to the troubleshooting chart (table 11-6) to determine their cause.

After completion of the Pressure Breathing Test, leave the OUTPUT valve slightly open. Open the CHAMBER BLEED valve and return the chamber to sea level.

Open the chamber door and close the OUTLET valve. Stop the vacuum pump.

Turn the INLET PRESSURE ON/OFF valve to OFF, and remove the regulator from the test stand.

Close the N_2 supply cylinder valve and, using the LOW PRESSURE REGULATOR and SYSTEM BLEED valves, relieve all pressure in the test stand. Secure all test stand valves.

When the bench test is completed, the test stand operator and the CDI sign the Performance Test Sheet. The original, or a copy, of the Performance Test Sheet shall be forwarded to the operational custodian of the regulator.

CHAPTER 12

AIRCRAFT PANEL MOUNTED OXYGEN REGULATORS

The MD-1, CRU-52/A, CRU-54/A, CRU-55/A, MD2, and CRU-72/A shown in figures 12-1 and 12-2 are panel mounted, automatic positive pressure diluter demand-type regulators and are used in conjunction with a pressure breathing type oxygen mask. The regulators provide 100 percent oxygen, or an air/oxygen mixture at the correct ratio depending on altitude, to the user on demand. The regulators incorporate an emergency pressure control lever. During normal operation, the lever is set in the NORMAL position. A TEST MASK position is provided to test the oxygen supply function of the regulators at low altitudes and at ground level. When in the EMERGENCY position the regulators deliver 100 percent oxygen to the user at a positive pressure. The EMERGENCY position is used when normal oxygen is suspected of being inadequate.

The regulators are supplied in two basic configurations: low pressure (50 to 500 psig operating pressure range), and high pressure (50 to 2000 psig operating range). Refer to table 12-1 for applicable models and part numbers.

MAINTENANCE

By following the procedural steps outlined in this chapter, you will be able to perform all of

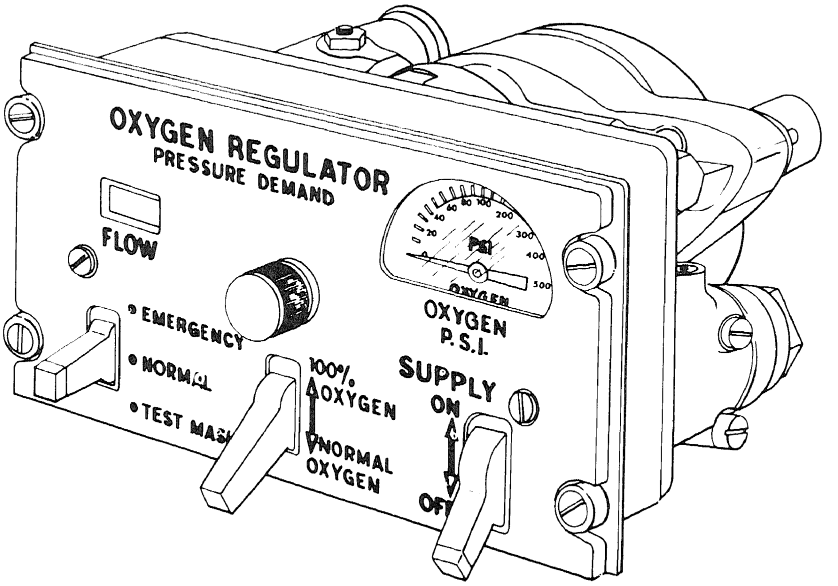

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Figure 12-1.—Aircraft panel mounted oxygen regulator, MD-1 (low pressure).

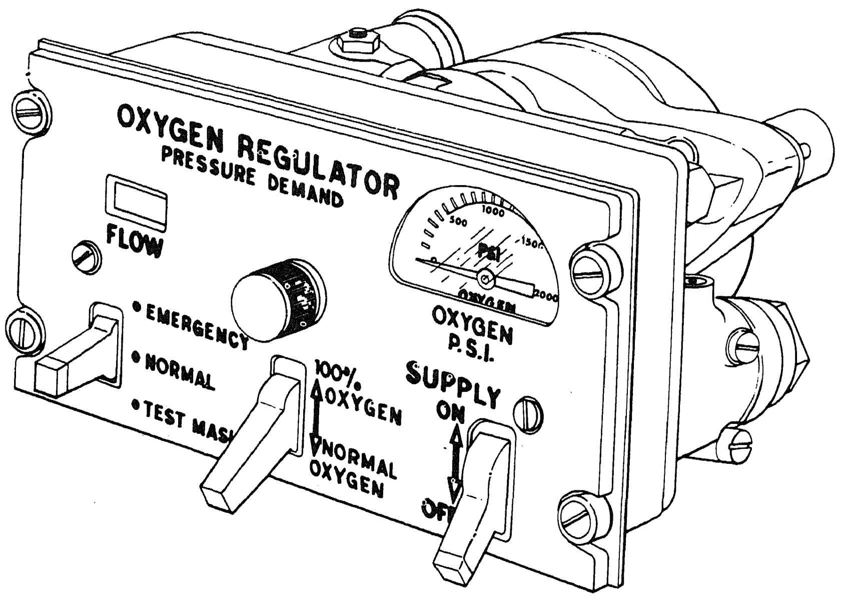

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Figure 12-2.—Aircraft panel mounted oxygen regulator, MD-2 (high pressure).

Table 12-1.—Leading Particulars

Type	Part Number	Operating Pressure Range
MD-1	14950-7B	50 to 500 psi
CRU-52/A	14950-26A	50 to 500 psi
CRU-54/A	14950-27A	50 to 500 psi
CRU-55/A	14950-28A	50 to 500 psi
MD-2	14800-8B	50 to 2000 psi
CRU-72/A	14800-8C	50 to 2000 psi

Voltage	28 Vdc
Mounting	Panel
Operating Altitude Range:	
Air-Oxygen Mixture	Up to 32,000 ft
100 Percent Oxygen (Normal plus Pressure Breathing)	Up to 43,000 ft
100 Percent Oxygen (Normal Plus Pressure Breathing, Short time only)	50,000 ft
Visual Indicators	Pressure Gage and Flow Indicator on Front Panel
Regulator Controls:	
Diluter Lever	Selects NORMAL or 100% OXYGEN
Supply Lever	Opens and closes oxygen supply
Emergency Lever	For emergency, and ground test of mask
Overall Dimensions:	
Length	4 7/32 in.
Width	5 3/4 in.
Height	3 in.
Weight	2.85 lb.

Table 12-2.—Troubleshooting (daily, preflight, special, turnaround, transfer and acceptance inspections)

Trouble	Probable Cause	Remedy
Oxygen cylinder pressure gage fails to indicate proper pressure	Defective gage	Replace regulator.
	Blocked or leaking supply line	Replace or clean supply line to regulator.
	Low cylinder pressure	Refill.
	Defective manifold inlet assembly	Replace regulator.
Oxygen not available at mask with proper pressure source to regulator and other than emergency setting on regulator	Regulator controls improperly positioned	Correct position of controls.
	Hose to mask is kinked	Straighten hose and reposition outlet.
	Regulator not functioning properly	Replace regulator.
Oxygen not available at mask with proper pressure source to regulator and regulator control set at EMERGENCY	Kink or other malfunction between hose and mask	Replace or readjust equipment as neccesary.
	Faulty linkage from emergency pressure control level	Replace regulator.
Oxygen available at mask but flow is not indicated	Defective blinker assembly	Replace regulator.
Gage pressure drops when regulator is not in use	Loose or leaking connections	Tighten or replace connections as necessary.
	Defective manifold inlet assembly	Replace regulator.
Panel light fails to light	Burned out lamp	Replace lamp.
	Faulty light assembly	Replace Regulator.
	Faulty electrical hookup to power source	Repair electrical hookup.

the required inspections, troubleshooting, and be able to make minor adjustments and repairs to aircraft mounted oxygen regulators.

When assigned to an AIMD or a depot-level maintenance activity, you may be involved in making repairs to these regulators. You should always remember that when the cost of repairs starts to be more than approximately 75% of the cost of the regulator, it shall be considered beyond economical repair.

TURNAROUND/PRELFIGHT/POSTFLIGHT/TRANSFER INSPECTIONS

The Turnaround/Preflight/Postflight/Transfer inspections consist of a visual type inspection performed in conjunction with the aircraft inspection requirements for the aircraft in which the regulators are installed. Refer to table 12-2 for assistance in troubleshooting. To perform the inspection, visually inspect the following:

1. Electrical performance of panel light.
2. Legibility of all markings.
3. Plastic lighting plate for cracks and discoloration.
4. Low, or improper reading on regulator pressure gage.
5. Emergency pressure control lever in NORMAL position.

6. Diluter control lever in 100% OXYGEN position.
7. Supply control lever in OFF position.
8. Regulator and surrounding area for freedom from dirt and hydrocarbons.
9. Delivery hose and connector for cuts, graying, kinking, hydrocarbons and general condition.

If discrepancies are found or suspected, notify Maintenance Control.

If a regulator does not pass your inspection and the defect cannot be repaired in the aircraft, remove it and put in a Ready for Issue (RFI) regulator. Forward the defective regulator to an aircraft intermediate maintenance activity that can fix it.

ACCEPTANCE/SPECIAL/DAILY INSPECTIONS

The Acceptance/Special/Daily inspections consist of a visual type inspection followed by a functional test. These inspections and tests shall be performed in conjunction with the aircraft inspection requirements for the aircraft in which the regulators are installed. These inspections are performed at the organizational level by AMEs. However, you should know what they are supposed to inspect. Refer to table 12-2 for assistance in troubleshooting. To perform the inspection, proceed as follows:

Visually inspect the regulators as you did in the preflight inspection.

Functional Test

To perform the functional test proceed as follows:

1. Place the supply valve control lever in the ON position.

2. Place the diluter control lever in NORMAL OXYGEN position.

3. Using an oxygen mask and hose assembly, connect the hose to the quick disconnect. While at ground level, the regulator will not supply oxygen from the supply system to the mask. The emergency pressure control lever must therefore be used in order to check out the oxygen supply function of the regulator at low altitudes. (The emergency lever is spring loaded at the NORMAL position, and will return to NORMAL when released.) Place the mask to your face with the regulator in test mask position and inhale. Proper regulator operation will be indicated by flow indicator assembly showing white during inhalation and black during exhalation.

4. Hold the emergency pressure control lever in the TEST MASK position and observe the flow indicator. The flow indicator should be white, indicating a flow through the regulator.

Upon completion of the functional test, secure the regulator as follows:

1. Disconnect the mask from the supply hose.
2. Ensure that the emergency pressure control lever returns to its NORMAL position.
3. Place the diluter control lever in the 100% position.
4. Place the supply valve control lever in the OFF position.

If any discrepancies are found or suspected, Maintenance Control shall be notified. If repairs cannot be made in the aircraft, replace the regulator and forward the defective regulator to AIMD for repairs.

CALENDAR/PHASED/SDLM INSPECTIONS

You must remove the regulator to give it a Calendar, Phased or SDLM (Standard Depot Level Maintenance) inspection. See applicable Planned Maintenance System (PMS) publications for specified intervals. In no case shall the interval exceed 225 days. Upon removing it from the aircraft, the regulators shall be visually inspected and sent to AIMD for bench testing.

Aircraft panel mounted regulators failing the bench test shall be repaired. Source, Maintenance and Recoverability (SM&R) codes define repairability of components and lowest level of maintenance authorized.

Service Life

Oxygen regulators shall remain in service for as long as they function correctly and do not require excessive repair (exceeds 75% of original cost of regulator). All silicone rubber parts shall be replaced whenever a regulator is disassembled for repair.

Bench Test

Bench tests shall be performed on Aircraft Panel Mounted Oxygen Regulators prior to being placed in service, and during the phase/calendar or SDLM inspection cycle of the aircraft in which installed. See applicable Planned Maintenance System (PMS) publications for specific intervals. In no case shall the interval exceed 225 days. The regulators shall also be subjected to a bench test if malfunction is suspected, and after repair or replacement of damaged parts.

Bench tests shall be performed using Oxygen System Components Test Stand Model 1172AS100 in accordance with NAVAIR 13-1-6.4.

Due to the complexity of the 1172AS100 test stand, it is essential that the operator become thoroughly familiar with the test stand prior to performing bench tests. (Refer to chapter 4 of NAVAIR 13-1-6.4.)

NOTE: Nitrogen supply cylinders utilized in testing oxygen components shall be 80 cubic feet and contain a maximum pressure of 2000 ± 200 psig. For tests requiring pressures of 1800 psig, use highest available pressure, but in no case shall this pressure be less than 500 psig.

Inward Leakage Test

By applying 9.0 inches (H_2O) of suction to the regulator outlet, you are testing the regulator to be leaktight. If a leak is present it could effect other tests covered in the chapter. It could also prevent the aircrewman from receiving 100% oxygen by allowing ambient air to enter the regulator.

To perform the inward leakage test, proceed as follows:

1. Ensure that all test stand valves are closed, then open N_2 supply cylinder valve.

2. Place the regulator supply control valve lever in the OFF position, and the diluter control lever in the 100% OXYGEN position.

3. Ensure that the regulator emergency pressure control lever is in the NORMAL position.

4. Mount the adapter supplied with the test stand (NAVAIR Drawing No. 1172AS136), connect the regulator outlet to the N_2 INPUT connection in the altitude chamber.

5. Connect a line from the LOW PRESS, connection to REFERENCE TAP in the altitude chamber. Plug the rubber hose attached to the piezometer by using the piezometer plug supplied with the test stand. Ensure that the LOW PRESSURE REGULATOR is not loaded. This will prevent N_2 supply cylinder pressure from passing on to the INLET PRESSURE ON/OFF valve which could damage the test item, or injure the test stand operator.

6. Turn the INLET PRESSURE ON/OFF valve to the ON position. The Vacuum Vent must be opened one to two turns when you operate the vacuum pump. Turn the vacuum pump on.

7. Turn the PRESSURE SELECTOR valve to the H_2O position, and fully open the LEAKAGE CONTROL valve.

8. Ensure that the LEAKAGE SELECTOR valve is in the HIGH RANGE position.

9. The leakage rotameter is calibrated with an applied pressure of 70 psig. The inward leakage test requires that a suction of 9.0 in H_2O be applied to the regulator outlet and the rotameter. This pressure difference (9.0 in H_2O vice 70 psig) creates a wide variance between actual leakage and indicated leakage. The maximum allowable leakage for the inward leakage test is 200 cubic centimeters per minute and will be displayed as 740 ccm on the high range leakage rotameter.

NOTE: Because of labeling on gages, the abbreviation ccm is used in this text. Since the cubic centimeter has been replaced by the milliliter, this abbreviation should be ml/min instead of ccm. The proper abbreviation may appear on later equipment and newer technical manuals.

Slowly open the OUTPUT valve until 9 in. H_2O suction is indicated on the PRESSURE/SUCTION manometer. Any leakage will be displayed on the HIGH RANGE LEAKAGE rotameter. The maximum allowable indicated leakage reading is 740 ccm (actual

Table 12-3A.—Troubleshooting (inward leakage test)

Trouble	Probable Cause	Remedy
Diluter plate control housing and check valve assembly leaking	Damaged diluter valve assembly	Replace diluter valve assembly
	Diluter housing gasket leaking	Tighten screws, or replace diluter housing gasket
	Preformed packing leaking	Replace preformed packing
	Diluter plate and seat assembly damaged	Replace diluter plate and seat assembly
	Manual diluter valve lever bent or binding	Replace manual diluter valve lever
Diluter valve control lever leaking	Diluter valve control lever not adjusted properly	Adjust diluter valve control lever
Leakage from regulator outlet	Preformed packing leaking	Replace preformed packing
	Loose screws	Tighten screws
Leakage at relief valve	Leakage past relief valve, or relief valve seat excessive	Replace relief valve and seat

200 ccm). Record the indicated leakage on the Performance Test Sheet.

10. Close the OUTPUT valve and the LEAKAGE CONTROL valve. Turn the vacuum pump OFF. Turn the INLET PRESSURE ON/OFF valve to the OFF position.

11. Disconnect the line from the LOW PRESSURE connection and REF. TAP in the altitude chamber. Disconnect the regulator outlet from N_2 INPUT connection and remove the plug from the piezometer.

12. If excessive leakage is indicated, locate the probable cause by using troubleshooting chart, table 12-3A.

Outlet Leakage Test

To perform an outlet leakage test, proceed as follows:

1. Place the regulator supply valve control lever in the ON position.

2. Ensure that the diluter control lever is in the 100% OXYGEN position.

3. Place the emergency pressure control lever in the NORMAL position.

4. Mount the regulator on a horizontal plane in the test chamber. Connect the regulator inlet to the N_2 INPUT connection (18) inside the altitude chamber.

5. By using the LOW PRESSURE REGULATOR, apply 150 psig to the regulator inlet.

6. Slowly turn the INLET PRESSURE ON/OFF valve to ON.

7. Activate the emergency pressure control lever to allow a flow through the regulator then return the lever to its NORMAL position.

8. Draw a film of leak detection compound (MIL-L-25567) across the regulator outlet. The film shall not advance more than 1/2 inch in 10 seconds. If the film advance is more than allowable, repeat the test three or four times. (Distention could be caused by difference in

Table 12-3B.—Troubleshooting (outlet leakage test)

Trouble	Probable Cause	Remedy
Demand valve assembly leaking	Damaged demand valve seat	Replace seat
	Damaged demand valve assembly	Replace assembly
	Damaged preformed packings	Replace packings
Emergency pressure control assembly loading	Emergency pressure lever stem out of adjustment	Readjust elastic nut so that emergency pressure control assembly is not loading diaphragm
Pressure breathing aneroid assembly	Expanded aneroid	Replace aneroid
	Improperly adjusted aneroid	Add or delete shims
First stage reduction pressure	Pressure too high	Adjust to 32 to 35 psi
First stage regulator valve and lever assembly	Lever pivot screw improperly adjusted	Readjust until approx. 2 or 3 threads show
First stage relief valve	Damaged relief valve seat	Replace seat
	Pressure too low	Adjust to 55 to 60 psig
	Weak relief valve spring	Replace spring
	Damaged preformed packing	Replace packing

temperature between inside and outside of regulator.)

9. If the film advance continues to be more than allowed, locate the probable cause by using the troubleshooting chart, table 12-3B.

10. Relieve pressure on the regulator by backing out on the LOW PRESSURE REGULATOR.

OXYGEN SUPPLY VALVE LEAKAGE TEST.—If the supply pressure could not be shut off, until a demand was placed on it, a pressure build-up could be created. It could damage the regulator, hose or mask and possibly injure the crewmen. To perform the oxygen supply valve leakage test with the regulator still mounted in the chamber, proceed as follows:

1. Place the regulator oxygen supply valve lever in the OFF position.

Table 12-4.—Inlet pressure (oxygen supply valve leakage test)

Type	Inlet Pressure (psig)
MD-1	500
MD-2	1800
CRU-52/A	500
CRU-54/A	500
CRU-55/A	500
CRU-72/A	1800

2. Place the emergency pressure control lever in the EMERGENCY position.

3. Using HIGH PRESSURE REGULATOR, apply pressure specified in table 12-4 to the regulator inlet. Slowly turn the INLET PRESSURE ON/OFF valve to ON.

4. Draw a film of leak detection compound (MIL-L-25567) across the regulator outlet fitting. As in the last test see if there is any distention of the film.

Table 12-5.—Troubleshooting (oxygen supply valve leakage test)

Trouble	Probable Cause	Remedy
Loading of manifold inlet assembly	Supply valve control stem out of adjustment	Readjust supply valve control stem
Leaking manifold inlet assembly	Damaged ball	Replace ball
	Damaged supply valve seat	Replace seat
	Damaged supply valve seat retainer	Replace retainer
	Damaged preformed packings	Replace damaged packing(s)

5. There is no allowable leakage. If leakage is noted, locate probable cause using troubleshooting chart, table 12-5.

6. Place the emergency control lever in the NORMAL position.

OVERALL LEAKAGE TEST.—Test, by trapping pressure in the regulator, for any leakage anywhere on or in the regulator. Perform the overall leakage test first with diluter lever in its 100% OXYGEN position, and then repeat it with the lever in the NORMAL OXYGEN position.

1. Place regulator oxygen supply valve lever in the ON position, and emergency pressure control lever in the NORMAL position.

2. By using test stand HIGH PRESSURE REGULATOR, apply pressure specified in table 12-6 to regulator inlet.

Table 12-6.—Inlet pressure (overall leak test)

Type	Inlet Pressure (psig)
MD-1	500
MD-2	1800
CRU-52/A	500
CRU-54/A	500
CRU-55/A	500
CRU-72/A	1800

3. Turn INLET PRESSURE ON/OFF valve to OFF. Leave the regulator oxygen supply valve lever in the ON position.

4. Leakage will be indicated on the regulator pressure gage. Allowable leakage shall not exceed 60 psig over a 2-minute period. Repeat the test with the diluter lever turned to NORMAL OXYGEN.

5. If allowable leakage is exceeded, locate the probable cause by using the troubleshooting chart, table 12-7.

6. Turn the HIGH PRESSURE REGULATOR to VENT.

7. Bleed the regulator by placing the emergency pressure control lever in the EMERGENCY position. Return the lever to NORMAL.

8. Bleed the test stand using the SYSTEM BLEED valve.

REGULATOR PRESSURE GAGE SCALE AND ERROR TEST.—This test ensures that the pressure gage is operating properly and within tolerance. To perform the regulator pressure gage scale and error test, proceed as follows:

1. Turn the INLET PRESSURE ON/OFF valve to ON. The LOW PRESSURE REGULATOR can only be used when applying pressures below the gage guard setting (165 to 175 psig) to an item under test. For pressures above the gage guard setting, the HIGH PRESSURE REGULATOR must be used.

Table 12-7.—Troubleshooting (overall leakage test)

Trouble	Probable Cause	Remedy
Manifold inlet assembly leaking	Loose manifold inlet adapter	Tighten or replace manifold inlet adapter
	Damaged preformed packings	Replace damaged packing(s)
	Loose manifold inlet assembly screws	Tighten screws
Pressure gage leaking	Oxygen cylinder pressure gage assembly	Replace pressure gage
	Damaged preformed packing	Replace packing
	Loose screws	Tighten screws
First stage reduction chamber leaking	Loose screws on first stage cover plate	Tighten screws
	Damaged first stage gasket	Replace gasket
	Damaged first stage bellows gasket	Replace gasket
Pressure breather assembly leaking	Loose screws	Tighten screws
	Damaged preformed packing	Replace packing
	Damaged pressure breather valve assembly	Replace assembly
Emergency pressure control assembly loading	Emergency pressure control lever and center assembly loading diaphragm and plate assembly	Adjust emergency pressure control stem by tightening or loosening elastic nut
	Wrong size emergency pressure spring guide	Replace with shorter guide

2. Using LOW PRESSURE REGULATOR, slowly increase pressure to each test pressure 100 psig and below as specified in table 12-4. Record the regulator pressure gage readings twice, once before and once after tapping regulator pressure gage.

3. Check the tolerance by comparing the regulator pressure gage reading with the test stand INPUT PRESSURE gage.

4. Back out on the LOW PRESSURE REGULATOR.

5. Continue the test for 500 psig pressure by using the HIGH PRESSURE REGULATOR.

6. Turn the HIGH PRESSURE REGULATOR to VENT.

7. Bleed the test stand by using the SYSTEM BLEED valve. Bleed the regulator using the Emergency Pressure Control Lever.

OUTWARD LEAKAGE TEST.—In performing this test, the relief valve shall not be covered. The allowable leakage through this valve at 17.0 in. H_2O is included in the maximum allowable leakage 120 ccm.

NOTE: This text uses the abbreviations lpm for liters per minute. Newer equipment and technical manuals may use the correct abbreviation which is L/min.

Table 12-8.—Troubleshooting (outward leakage test)

Trouble	Probable Cause	Remedy
Diluter plate control housing and check valve assembly leaking	Damaged diluter plate control housing and check valve preformed packings	Replace packings
	Damaged air valve seat	Replace diluter control housing
	Damaged check valve disc	Replace disc
	Improperly adjusted diluter plate control housing and check valve assembly	Adjust spring and screw adapter assembly
	Loose screws	Tighten screws
Regulator outlet leaking	Damaged preformed packings	Replace packings
	Damaged or loose outlet	Tighten, or replace outlet
	Excessive inward leakage	
Flow indicator leaking	Damaged blinker diaphragm assembly	Replace blinker diaphragm assembly
	Damaged blinker tubing and base plate	Replace blinker tubing and base plate
	Loose screws	Tighten screws
Second stage relief valve leaking	Out of adjustment	Adjust spring retainer
	Weak second stage relief valve spring	Replace spring
	Loose housing screws	Tighten screws
	Damaged gasket	Replace gasket
	Damaged preformed packing	Replace packing
Outer diaphragm, diaphragm and plate assembly leaking	Loose screws	Tighten screws
	Damaged outer diaphragm	Replace outer diaphragm
	Damaged diaphragm and plate assembly	Replace diaphragm and plate assembly

With the regulator still mounted in the chamber, proceed as follows:

1. Place the regulator supply valve control lever in the OFF position, and the diluter control lever in the NORMAL OXYGEN position.

2. Connect the regulator outlet to the piezometer in the altitude chamber.

3. Connect a line from the LOW PRESSURE connection to the REFERENCE TAP inside the chamber.

4. Turn the test stand INLET PRESSURE ON/OFF valve to the OFF position.

5. Adjust the LOW PRESSURE REGULATOR until 70 psig is indicated on the REGULATED LOW PRESSURE gage.

6. Turn the PRESSURE SELECTOR valve to the H_2O position, and slowly open the LEAKAGE CONTROL valve until 17.0 in. H_2O is indicated on PRESSURE/SUCTION manometer. By adjusting the LEAKAGE CONTROL, you maintain a 17.0 in. H_2O indication throughout this test.

7. If no leakage is indicated on the HIGH RANGE LEAKAGE rotameter, turn the LEAKAGE SELECTOR valve to the low range position, and check for an indication of leakage on the low RANGE LEAKAGE rotameter. Allowable leakage is 0.12 lpm (120 ccm).

8. Switch the LEAKAGE SELECTOR valve to HIGH position, and close the LEAKAGE CONTROL valve.

9. Repeat steps 6, 7, and 8 with the diluter control lever in the 100% OXYGEN position.

10. If leakage is excessive, locate its probable cause using troubleshooting chart, table 12-8.

SECOND STAGE RELIEF VALVE TEST.—To perform the second stage relief valve test, proceed as follows:

1. Turn the PRESSURE SELECTOR valve to the Hg position, and place the FLOW SELECTOR valve in the CONTROLLER position.

2. Ensure the diluter control lever is in the 100% OXYGEN position.

3. Using the VENT PRESSURE Valve, slowly apply 3 inches of mercury to the regulator outlet. The regulator relief valve should be venting at least 45 lpm as indicated on the vent Flow manometer.

4. Close the VENT PRESSURE valve and bleed the pressure down to 0 in Hq using VENT AMBIENT valve. Close the valve.

5. Turn the FLOW SELECTOR valve to the REGULATOR position and close the VENT AMBIENT valve.

6. Slowly move the PRESSURE SELECTOR valve to the H_2O position.

7. Turn the LEAKAGE SELECTOR valve to the LOW position.

8. Open the LEAKAGE CONTROL valve. Apply and maintain 17.0 in. H_2O to regulator outlet. Maximum allowable leakage is 0.12 lpm (120 ccm).

9. Close the LEAKAGE CONTROL valve.

10. Back out on the LOW PRESSURE REGULATOR and bleed the pressure with the SYSTEM BLEED valve.

11. Turn the LEAKAGE SELECTOR valve to the HIGH RANGE position.

12. If excessive leakage is found, locate the probable cause using the troubleshooting chart, table 12-8. If the relief valve does not vent, locate the probable cause by using the troubleshooting chart, table 12-9.

FLOW SUCTION TEST.—This test determines how much suction will be required by the user to achieve or receive a given amount of oxygen or air/oxygen mixture through the regulator. To perform the flow suction test, proceed as follows:

1. Disconnect the hose from the LOW PRESSURE connection and REFERENCE TAP connection inside the altitude chamber.

2. Turn vacuum pump ON.

3. Ensure that the PRESSURE SELECTOR Valve is in the H_2O position.

4. Ensure that the regulator diluter control lever is in the 100% OXYGEN position.

5. Ensure that the INLET PRESSURE ON/OFF valve is ON.

6. Ensure that the regulator supply valve control lever is in the ON position.

Table 12-9.—Troubleshooting (second stage relief valve test)

Trouble	Probable Cause	Remedy
Second stage relief valve does not vent 45 lpm	Out of adjustment	Adjust spring retainer
	Second stage relief valve spring too strong	Replace spring

Table 12-10.—Troubleshooting (flow suction test)

Trouble	Probable Cause	Remedy
First stage reduction chamber out of adjustment	Low first stage pressure	Reset to 32 to 35 psig
Demand valve lever assembly	Vane mounting pin	Replace mounting pin
	Strong demand valve lever spring	Replace demand valve lever spring
	Demand valve lever bent, or improperly adjusted	Replace, or adjust
Manifold inlet assembly	Clogged inlet filter	Replace inlet filter
Venturi assembly	Strong injector spring	Replace injector spring

7. By using the LOW PRESSURE REGULATOR, set the inlet pressure at each inlet pressure specified on the Performance Test Sheet.
8. By using the OUTPUT valve, set flows specified in the Performance Test Sheet on the OUTPUT manometer. Readings must be recorded with the regulator diluter control lever in both NORMAL and 100% OXYGEN positions for each outlet flow specified on the Performance Test Sheet. Suction values will be displayed on PRESSURE/SUCTION manometer. With no suction on the regulator (OUTPUT valve closed), maximum flow through regulator shall not exceed 0.01 lpm. This will cause a slight rise in the PRESSURE/SUCTION manometer reading. Record readings on the Performance Test Sheet.
9. Close OUTPUT valve.
10. If the regulator fails the Flow Suction Test, locate the probable cause by using the troubleshooting chart in table 12-10.

OXYGEN RATIO TEST.—This test determines the amount of oxygen mixed with ambient air up to 32,000 feet where 100% oxygen will be automatically delivered to the user. To perform the oxygen ratio rest, proceed as follows:

1. Ensure that the regulator supply valve control lever is in the ON position, and the diluter control lever is in the NORMAL OXYGEN position.
2. By using the LOW PRESSURE REGULATOR, apply 150 psig to the regulator inlet. Slowly open the VACUUM CONTROL valve (B_1) and observe the PRESSURE/SUCTION manometer. If a rapid increase in pressure is indicated, close down on VACUUM CONTROL valve (B_1) until pressure stabilizes. This rapid increase of pressure shown on PRESSURE/SUCTION manometer is caused by too fast a rate of climb in the altitude chamber. Maintain 3.0 in. H_2O on the OUTPUT manometer with OUTPUT valve while "ascending to altitude".

3. Using VACUUM CONTROL valve (B_1) ascend to the first test altitude shown on the Performance Test Sheet.

4. Set the output flows specified in the Performance Test Sheet with OUTPUT valve and stabilize altitude with INPUT valve.

5. Read all readings on the INPUT manometer, and record all readings on the Performance Test Sheet.

6. Continue the test for each specified altitude and output flow shown on the Performance Test Sheet.

7. Close OUTPUT valve and INPUT valve. Descend to 27,000 feet using CHAMBER BLEED valve.

8. If Oxygen Ratio Test was satisfactory, proceed to make the Safety Pressure and Pressure Breathing Test. If indicated input flows are not within limits, an Aneroid Closure Test must be performed. The aneroid Closure Test is performed only if regulator fails the Oxygen Ratio Test.

Table 12-11.—Troubleshooting (oxygen ratio/aneroid closure tests)

Trouble	Probable Cause	Remedy
Incorrect air/oxygen ratios for flows 40 lpm or less	Low air	Turn screw in spring and screw adapter assembly counterclockwise
	High air	Turn screw in spring and screw adapter assembly clockwise
Incorrect air/oxygen ratio for flows above 40 lmp	Low air	Install shorter shouldering screw
	High air	Install longer shouldering screw
Aneriod closes below 28,000 feet	Aneroid stem out of adjustment	Turn aneroid stem counter-clockwise
Aneriod closes above 32,000 feet	Aneroid stem out of adjustment	Turn aneroid stem clockwise

ANEROID CLOSURE TEST.—The aneroid closure test is preformed only if the regulator fails the oxygen ratio test. To perform the aneroid closure test, proceed as follows:

1. Descend to 25,000 feet by using the CHAMBER BLEED valve.

2. Ensure that the inlet pressure is as specified on the Performance Test Sheet.

3. Set up a flow of 5.0 in. H_2O on the OUTPUT FLOW manometer with OUTPUT valve.

4. The aneroid shall close between 28,000 and 32,000 feet, as indicated by no further advance in altitude on the LOW RANGE altimeter.

5. Close the OUTPUT valve and descend to sea level by using the CHAMBER BLEED valve.

6. If the regulator fails Aneroid Closure Test and/or Oxygen Ratio Test, locate probable cause using troubleshooting chart, table 12-11.

SAFETY PRESSURE AND PRESSURE BREATHING TEST.—This test determines if, 100% oxygen is being delivered to the user through the regulator between 30 and 50,000 feet. To perform the Safety Pressure and Pressure Breathing Test, proceed as follows:

1. By using the LOW PRESSURE REGULATOR apply 150 psig to the regulator inlet. If chamber altitude is not at 30,000 feet adjust the altitude by using VACUUM CONTROL valve (B_1) to increase, or CHAMBER BLEED valve to decrease altitude.

2. Using the OUTPUT valve, draw flows of 0, 40 and 85 lpm through the regulator. Delivery pressure must be within limits shown on Regulator Performance Test Sheet. Maintain 3.0 in. H_2O on Output manometer with OUTPUT valve while ascending to altitude. The reading for 0 lpm must also be recorded at each test altitude.

3. Repeat step 2 for each altitude shown on the Performance Test Sheet.

4. Close the OUTPUT valve and descend to sea level by using CHAMBER BLEED valve.

Table 12-12.—Troubleshooting (safety pressure/pressure breathing test)

Trouble	Probable Cause	Remedy
Low safety pressure/pressure breathing	Clogged inlet filter	Replace inlet filter
	Damaged outer diaphragm	Replace outer diaphragm
	Aneroid shims too thin	Replace with thicker shims
	Aneroid screw or locknut too short	Replace with longer screw or locknut
	Pressure breather valve sticking or bent	Replace pressure breather valve
High safety pressure	Aneroid shims too thick	Replace with thinner shims
	Pressure breather valve sticking in open position, or bent	Replace pressure breather valve
	Cocked aneroid	Replace aneroid

5. If the Safety Pressure Breathing flows are not within limits, locate the probable cause using troubleshooting chart, table 12-12.

BLINKER ASSEMBLY TEST.—This test ensures that the blinker operates correctly with a demand placed on the regulator. To perform the blinker assembly test, proceed as follows:

1. Ensure that diluter control lever is in the NORMAL OXYGEN position.
2. By using the LOW PRESSURE REGULATOR apply 150 psig to the regulator inlet.
3. Using OUTPUT valve draw a 20 lpm through the regulator. The blinker must open fully.
4. Reduce output flow to 8 lpm and place the diluter control lever in the 100% OXYGEN position. The blinker must remain fully open.
5. Close OUTPUT valve. The blinker should close immediately.
6. Close the altitude chamber door. Ascend to altitude while maintaining 3.0 in. H_2O on the OUTPUT manometer with the OUTPUT valve.
7. By using the VACUUM CONTROL valve (B_1) ascend in altitude until 17.0 in. H_2O is indicated on the PRESSURE/SUCTION manometer.
8. Open OUTPUT valve and draw a flow of 12 lpm through the regulator. The blinker should be fully open. Close OUTPUT valve and the blinker should close immediately.
9. Descend to sea level using the CHAMBER BLEED valve.
10. Adjust or replace improperly functioning blinkers.

EMERGENCY PRESSURE TEST.—Determine how much pressure is supplied to the user on emergency pressure. To perform the emergency pressure test, proceed as follows:

1. Ensure the diluter control lever is in the NORMAL OXYGEN position.
2. By using the LOW PRESSURE REGULATOR apply 150 psig to the inlet of the regulator.
3. Open the OUTPUT valve and draw a 10 lpm flow through the regulator.
4. Place the emergency control lever in the EMERGENCY position. Pressure indicated on PRESSURE/SUCTION manometer shall read 2.0 to 4.0 in. H_2O.
5. Adjust the OUTPUT valve to draw 80 lpm through the regulator.
6. Place the diluter control lever in the 100% OXYGEN position. Pressure at outlet of

Table 12-13.—Troubleshooting (emergency pressure test)

Trouble	Probable Cause	Remedy
High emergency pressure at 10 lpm flow	Emergency pressure control stem out of adjustment	Turn emergency pressure control stem clockwise
Low emergency pressure at 10 lpm flow	Emergency pressure control stem out of adjustment	Turn emergency pressure control stem counterclockwise
Low emergency pressure at 80 lpm flow	Elastic stop nut out of adjustment	Adjust elastic stop nut conterclockwise
Low TEST MASK pressure	Emergency pressure spring guide too short	Install longer emergency pressure spring guide
High TEST MASK pressure	Emergency pressure spring guide too long	Install shorter emergency pressure spring guide

regulator, as indicated on PRESSURE/SUCTION manometer, shall be no less than 1.0 in. H_2O.

7. Close the OUTPUT valve. With zero flow, outlet pressure shall not exceed 5.5 in. H_2O.

8. Adjust the output to 10 lpm. Hold the emergency pressure control lever in TEST MASK position. The output flow indicated on the PRESSURE/SUCTION manometer shall be 6.0 to 16.0 in. H_2O.

9. Close the OUTPUT valve. With zero flow, outlet pressure shall not exceed 17.5 in. H_2O. Release the emergency pressure control lever. If the regulator fails adjust the emergency pressure control lever stem to obtain 3.0 to 4.0 in. H_2O at 10 lpm first, then compensate for excessive pressure drop at 80 lpm flow with the elastic stop nut.

10. If the emergency pressure flows are not within tolerance, locate the probable cause by using the troubleshooting chart, table 12-13.

11. Close the N_2 supply cylinder valve, by using the LOW PRESSURE REGULATOR and SYSTEM BLEED valve, relieve all pressure in the test stand. Secure all test stand valves.

12. Test stand operator and CDI must sign the Performance Test Sheet. The original, or a copy of the Performance Test Sheet shall be forwarded to the operational custodian of the regulator.

CHAPTER 13

LIQUID OXYGEN CONVERTER TEST STANDS

Liquid oxygen converters are another group of items that you as a PR are required to test and repair. There are two test stands designed to test the oxygen converters. The operation, maintenance and parts are, with a few minor exceptions, basically identical. The part numbers for the two test stands are 59A120 manufactured by Aerojet-General Corporation and the 31TB1995-1 manufactured by Pionier.

FUNCTION

The 59A120 Test Stand (figure 13-1) is designed to test liquid oxygen converters, components and Rigid Seat Survival Kit (RSSK) components. This function is accomplished by the converter routing a test gas through various valves, gages, and tubing to the item under test.

BELL JAR

The bell jar is used for testing components having more than one possible area of leakage. It consists of a relief valve RV-3, the bell jar itself, and the bell jar top coupling C-2 (figure 13-1). When operating properly, the relief valve RV-3 has a range of 5 to 15 psig. It is leak-tight at 5 psi, and is set to relieve at 10 psi.

DIFFERENTIAL PRESSURE GAGE, DF-1

The differential pressure gage is a bellows-operated gage that operates in the range of 0-100 in. H_2O (inches of water). The gage indicates differential pressure when testing pressure closing and opening valves.

RELIEF VALVE, RV-11

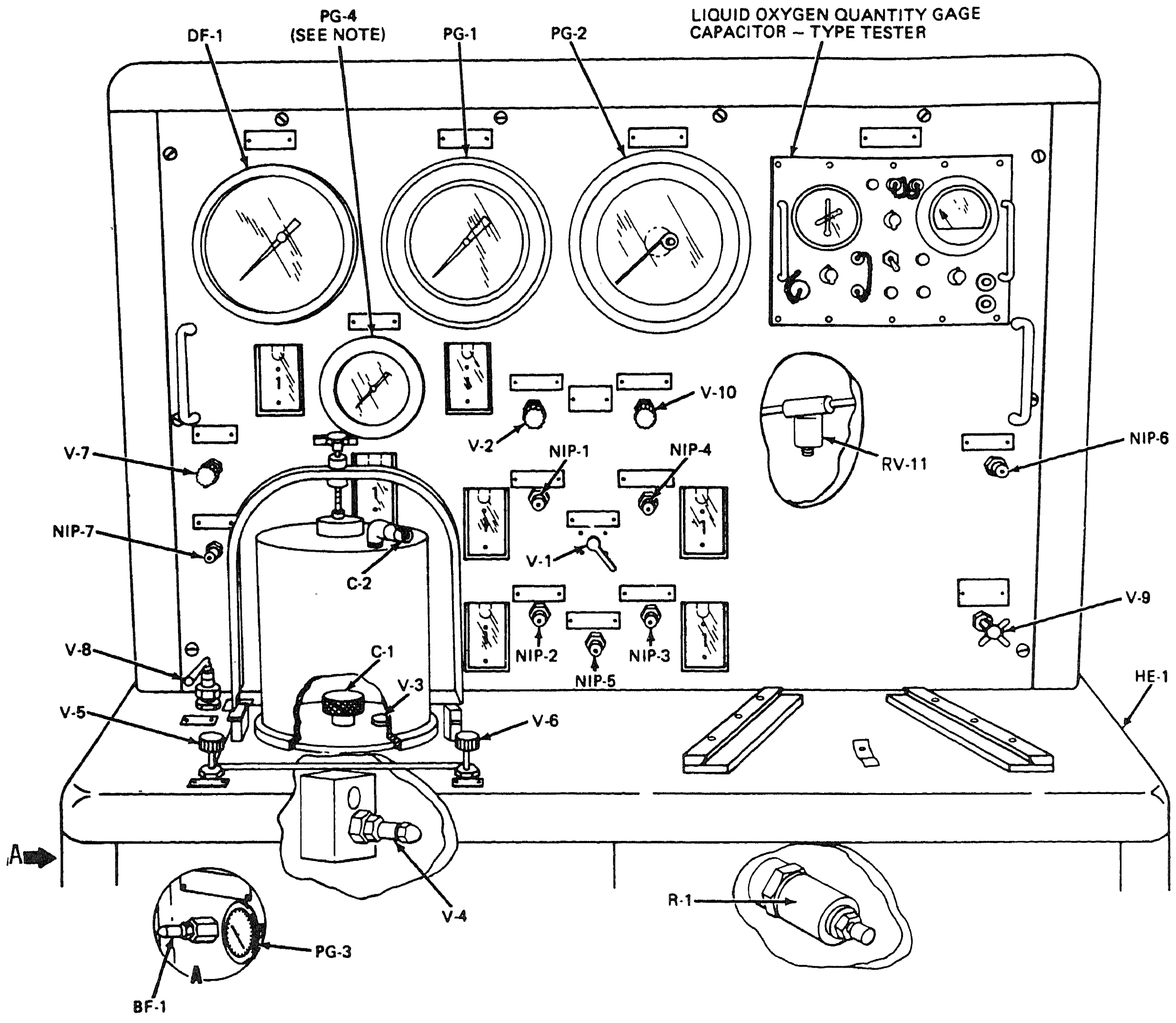
The converter section of the test stand is protected from excessive pressure by the RV-11 relief valve. This relief valve is set to relieve pressure in excess of 110 psig.

CONVERTER SUPPLY CONNECTION, NIP-6

The converter supply connection, NIP-6 connects the converter supply coupling, through the use of a hose, to the test stand. The flow of oxygen shown in figure 13-2 shows that the converter supply flow control valve V-9 controls the flow of oxygen from the liquid oxygen converter through the heat exchanger HE-1 to the buildup and flow valve V-10 and then to the adapter fixture.

LINEAR FLOW ELEMENTS

There are four linear flow elements. Each measures a different flow rate in liters per minute (LPM). By using a hose assembly connected from NIP-5 (converter supply outlet connection) to the correct one of the linear flow elements (NIP-1 for 0-00.25 LPM, NIP-2 for 0-1.0 LPM, NIP-3 for 0-50 LPM, or NIP-4 for 0-150 LPM), and turning the flowmeter selector valve you can measure leakage from an item under test.



1	Correction Card Holder
BF-1	Special Bulkhead Fitting
C-1	Bell Jar Bottom Coupling
C-2	Bell Jar Top Coupling
DF-1	0-100 INH$_2$O Differential Pressure Gage
HE-1	Heat Exchanger (Not Shown)
NIP-1	0-0.25 LPM Flowmeter Connection
NIP-2	0-1 LPM Flowmeter Connection
NIP-3	0-50 LPM Flowmeter Connection
NIP-4	0-150 LPM Flowmeter Connection
NIP-5	Converter Supply Outlet Connection
NIP-6	Supply To Converter Connection
NIP-7	Differential Pressure Gage Connection
PG-1	0-160 PSIG Test Pressure Gage
PG-2	Flowmeter Indicator Gage
PG-3	0-3000 PSIG Supply Pressure Gage
PG-4	0-15 PSIG Low Pressure Test Gage (See Note)
R-1	0-160 PSIG Oxygen Pressure Regulator
V-1	Flowmeter Selector Valve
V-2	Test Pressure Gage To Bell Jar Valve
RV-3	5-15 PSI Relief Valve (Set At 5 PSI)
RV-4	0-500 PSI Relief Valve (Set At 180 PSI)
V-5	System Bleed Valve
V-6	Oxygen Supply Valve
V-7	Differential Pressure Bleed Valve
V-8	Differential Pressure Shut-Off Valve
V-9	Converter Supply Flow Control Valve
V-10	Test Pressure Gage Build-Up And Flow Valve
RV-11	100-120 PSI Relief Valve (Set At 110 PSI)

NOTE: 59A120 ONLY

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Figure 13-1.—Liquid oxygen converter test stand 59A120 control panel and counter top.

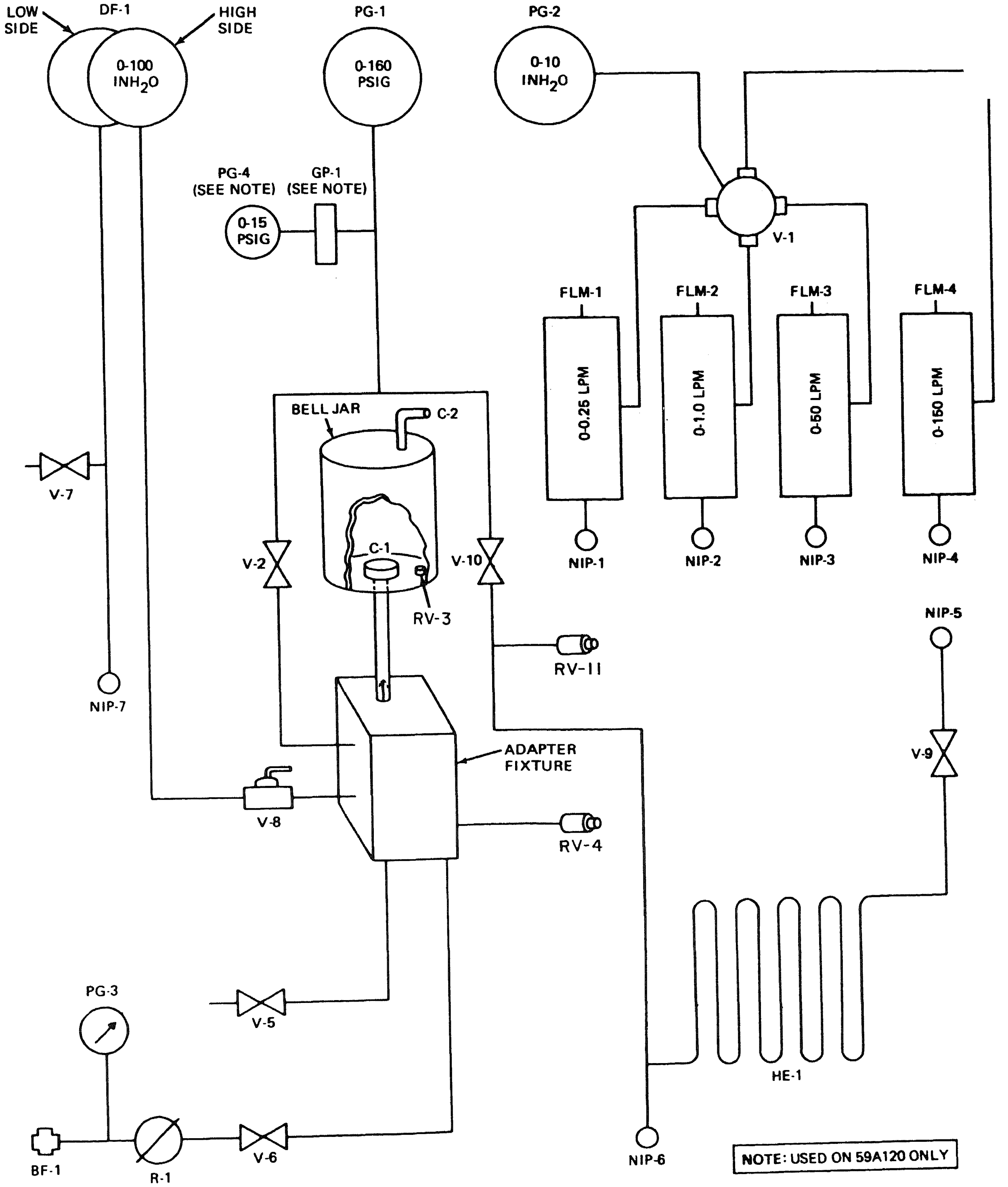

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Figure 13-2.—Test stand schematic.

LIQUID OXYGEN QUANTITY GAGE CAPACITOR-TYPE TESTER

The liquid oxygen quantity gage capacitor-type tester is located on the upper front panel of the test stand and operates on 115 Vac, 400-cycle current. It is used to measure capacitance and electrical insulation of the capacitance probe.

FLOW OF OXYGEN

As you turn on the supply of gas, it flows into the test stand through a special bulkhead fitting BF-1 (figure 13-1) and it is indicated on the 0-3000 psig pressure gage PG-3. It then flows to the adjustable pressure regulator R-1. The regulator is preset to deliver 160 psig to the remainder of the test stand through oxygen supply valve V-6. Oxygen supply valve V-6, a needle-type valve, admits oxygen to the adapter fixture and controls oxygen pressure to an item under test. From the adapter fixture, the test gas is routed to the following valves, gages, and disconnects:

Test gas enters the bell jar bottom coupling C-1. Your test item is also attached to this coupling. From C-1 it flows to the needle metering valve V-2 which allows the flow to continue to a test pressure gage PG-1.

NOTE: When opening valve V-2 you must close valve V-10. This prevents oxygen from entering the converter side of the test stand.

The test pressure gage PG-1 indicates the pressure applied to the item under test. The oxygen flow also goes from the adapter fixture to the differential pressure gage shutoff valve V-8. This valve prevents pressure from being admitted to the high side of the differential pressure gage DF-1 when the gage is not being used. Another flow from the adapter fixture is to the system bleed valve V-5. This valve is a needle-type valve and it is used to bleed the pressure from the test stand. On every test stand you will find a safety valve. In this case we have a relief valve V-4 which prevents excessive pressure buildup in the test stand. The valve is leak-tight at 160 psig and is set to relieve at 180 psig.

MAINTENANCE

Maintaining and preparing the test stand for use is divided into five separate tasks: installation, visual inspection, correction card preparation, calibration, and leak testing. These tasks, fully described in the following paragraphs, are outlined briefly below:

1. Installation includes selecting a suitable space, mounting, connecting to a suitable power supply and an oxygen source.

2. The visual inspection is performed to ensure the test stand has not been damaged during shipment and installation.

3. Correction/calibration cards (figure 13-3) provide an easy reference upon which indicated flows and pressures are recorded. Actual mandatory flows and pressures are taken from NAVAIR 17-15BC-20 and are prerecorded on the correction/calibration cards. The actual LPM flow must be converted to the indicated inches of H_2O flow and to millimeters (mm) flow by using the applicable flowmeter calibration graphs. This conversion is performed by the metrology calibration team.

NOTE: Additional actual pressures and flows have been added to the correction cards in figure 13-3. Addition of these pressures and flows reflect required actual pressures and flows needed to bench test RSSK kits and all models of LOX converters now in service.

4. Periodic leakage tests are conducted on the accessories section, bell jar assembly, and the entire test stand.

5. Calibration of the test stand is required to be performed prior to use. Calibration procedures shall be performed at 6-month intervals by the onsite metrology calibration team. Additional calibrations are not required.

CORRECTION CARD NUMBER 1	
ACTUAL IN. H_2O	INDICATED IN. H_2O
100	
80	
60	
40	
20	
10	

CORRECTION CARD NUMBER 2	
ACTUAL PSIG	INDICATED PSIG
160	
140	
130	
120	
110	
100	
95	
90	
85	
80	
76	
70	
60	
55	
40	
35	
30	
25	
20	

CORRECTION CARD NUMBER 3	
ACTUAL PSIG	INDICATED PSIG
14	
12	
10	
8	
6	
4	
2	

CORRECTION CARD NUMBER 4		
ACTUAL LPM	INDICATED IN. H_2O	MM
150		
122		
120		
100		
90		
75		
50		

0-150 LPM

Figure 13-3.—Calibration correction cards (Sheet 1 of 2).

LIQUID OXYGEN QUANTITY GAGE CAPACITOR-TYPE TESTER

The liquid oxygen quantity gage capacitor-type tester is located on the upper front panel of the test stand and operates on 115 Vac, 400-cycle current. It is used to measure capacitance and electrical insulation of the capacitance probe.

FLOW OF OXYGEN

As you turn on the supply of gas, it flows into the test stand through a special bulkhead fitting BF-1 (figure 13-1) and it is indicated on the 0-3000 psig pressure gage PG-3. It then flows to the adjustable pressure regulator R-1. The regulator is preset to deliver 160 psig to the remainder of the test stand through oxygen supply valve V-6. Oxygen supply valve V-6, a needle-type valve, admits oxygen to the adapter fixture and controls oxygen pressure to an item under test. From the adapter fixture, the test gas is routed to the following valves, gages, and disconnects:

Test gas enters the bell jar bottom coupling C-1. Your test item is also attached to this coupling. From C-1 it flows to the needle metering valve V-2 which allows the flow to continue to a test pressure gage PG-1.

NOTE: When opening valve V-2 you must close valve V-10. This prevents oxygen from entering the converter side of the test stand.

The test pressure gage PG-1 indicates the pressure applied to the item under test. The oxygen flow also goes from the adapter fixture to the differential pressure gage shutoff valve V-8. This valve prevents pressure from being admitted to the high side of the differential pressure gage DF-1 when the gage is not being used. Another flow from the adapter fixture is to the system bleed valve V-5. This valve is a needle-type valve and it is used to bleed the pressure from the test stand. On every test stand you will find a safety valve. In this case we have a relief valve V-4 which prevents excessive pressure buildup in the test stand. The valve is leak-tight at 160 psig and set to relieve at 180 psig.

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5. Calibration of the test stand is require to be performed prior to use. Calibratio procedures shall be performed at 6-mont intervals by the onsite metrology calibration team. Additional calibrations are no required.

CORRECTION CARD NUMBER 1	
ACTUAL IN. H_2O	INDICATED IN. H_2O
100	
80	
60	
40	
20	
10	

CORRECTION CARD NUMBER 2	
ACTUAL PSIG	INDICATED PSIG
160	
140	
130	
120	
110	
100	
95	
90	
85	
80	
76	
70	
60	
55	
40	
35	
30	
25	
20	

CORRECTION CARD NUMBER 3	
ACTUAL PSIG	INDICATED PSIG
14	
12	
10	
8	
6	
4	
2	

CORRECTION CARD NUMBER 4		
ACTUAL LPM	INDICATED IN. H_2O	MM
150		
122		
120		
100		
90		
75		
50		

0-150 LPM

Figure 13-3.—Calibration correction cards (Sheet 1 of 2).

CORRECTION CARD NUMBER 5		
ACTUAL LPM	INDICATED IN. H_2O	MM
40		
30		
20		
10		
5		
3		

0.0-50 LPM

CORRECTION CARD NUMBER 6		
ACTUAL LPM	INDICATED IN. H_2O	MM
1.0		
0.75		
0.50		
0.25		

0.0-1.0 LPM

CORRECTION CARD NUMBER 7		
ACTUAL LPM	INDICATED IN. H_2O	MM
0.20		
0.15		
0.10		
0.08		
0.07		
0.06		
0.05		
0.03		
0.02		
0.01		

0.0-0.25 LPM

Figure 13-3.—Calibration correction cards (Sheet 2 of 2).

INSTALLATION

The test stand may be installed in any convenient location. Table 13-1 includes nominal dimensions of the test stand. Total space requirements can be determined by adding a reasonable working area to the dimensions given in the table.

NOTE: The test stand has drilled flanges to allow stable mounting. If shock pads are placed under the stand, they must extend under the whole stand to give even distribution of support.

Power requirement for the test stand is 115 Vac, 400-cycle, single-phase service. The test stand is connected to a suitable power source by the electrical cable assembly.

A 300 to 2000 psig oxygen source is required. A metal strap on the left rear of the test stand is provided for mounting and securing the oxygen supply cylinder.

Table 13-1.—Test stand installation

LEADING PARTICULARS			
Width (in.)	Depth (in.)	Height (in.)	Weight (lb)
50.12	24.06	68.06	460

GENERAL TECHNICAL CHARACTERISTICS	
Indicator	Range
Supply Pressure Gage	0 to 3000 psig
Test Pressure Gage	0 to 160 psig
Low Pressure Test Gage (59A120 only)	0 to 15 psig
Differential Pressure Gage	0 to 100 in H_2O
Flowmeter Indicator	0 to 10 in H_2O
Leakage Linear Flow Element No. 1	0 to 0.25 liters per minute (lpm)
Leakage Linear Flow Element No. 2	0 to 1.0 lpm
Rate Linear Flow Element No. 1	0 to 50 lpm
Rate Linear Flow Element No. 2	0 to 150 lpm
Liquid Oxygen Quantity Gage Capacitor-Type Tester	
Capacitance measuring	
range	0 to 5,000 uuf in four ranges.
accuracy	± 0.5% of reading or 0.25% of maximum value of applicable capacitance measuring range, whichever is greater.
Insulation resistance measuring	
range	0 to 10,000 megohms in four ranges.
accuracy	± 0.125 inch of scale length.
Maximum voltage at test terminals	Less than 50 Vac.
Short Circuit Current of test terminals	Less than 200 milliamperes.

VISUAL INSPECTION

Visually inspect the test stand for the following:

1. Dial glasses for cracks or breakage.
2. All hoses for cracks or breaks.
3. All pipe and hose fittings for security of connection, worn, stripped or crossed threads.
4. All tubing for severe dents or punctures.
5. All valves for body cracks.
6. Heat exchanger for rupture, severe dents, or punctures.
7. Gage tester for damaged or loose parts, and tightness of terminals and connectors.

Any components found to be damaged or defective should be repaired or replaced. Refer to NAVAIR 17-15BC-20 for part numbers.

CALIBRATION CORRECTION CARD PREPARATION

The following procedures cover only preparation of calibration correction cards. The indicated psig and the indicated in. H_2O columns cannot be completed until after calibration of the test stand.

CAUTION

Individual correction cards should be prepared for each component tested on the test stand. Actual pressures and flows should be extracted from the applicable technical manuals. Cards should be prepared using procedures outlined in the following paragraphs. Failure to do so could result in erroneous readings.

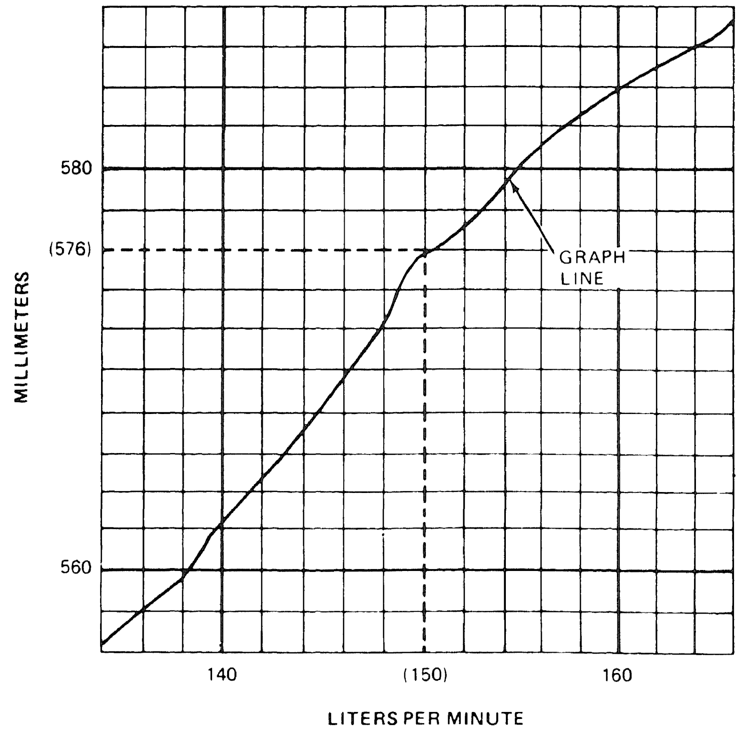
NOTE: Correction cards shown in figure 13-3 may be locally reproduced, or actual flows and pressure shown in the figure may be transferred to 3 × 3-inch cards.

Four graphs, one for each linear flow element, are supplied by the onsite metrology calibration team. The range of each graph corresponds to the range of the flow element to which it applies. The graphs are used for converting actual LPM flows to millimeters (mm). Graphs are assigned the same serial number as the test stand and are not interchangeable.

At this time, no other entries need be recorded on cards 1, 2, and 3. Indicated pressures will be entered during test stand calibration.

Convert the actual LPM flows to indicated millimeter (mm) flows on cards 4, 5, 6, and 7 as follows:

1. Using the applicable graph for the flowmeter selected, locate the desired LPM line at the bottom of the graph (see figure 13-4).
2. Trace the selected LPM line up to where it intersects the graph line.
3. Trace the line from point of intersection to the left hand edge of the graph to determine millimeters (mm). Enter this figure in the appropriate column of the correction card, figure 13-3.



CORRECTION CARD NUMBER 4

ACTUAL LPM	INDICATED IN. H_2O	MM
150		576
122		
120		
100		
75		
50		

239.552

Figure 13-4.—Conversion example.

4. Using applicable graphs, repeat steps 1 through 3 for all actual flows given on correction cards 4 through 7 (see figure 13-3).

5. Indicated flows (in. H_2O) will be entered on the cards during test stand calibration.

TEST STAND LEAKAGE TESTS

Test stand leakage tests are performed by personnel attached to the Oxygen Shop and consist of setting the oxygen pressure regulator, leak testing the accessories section, test stand section, and Bell Jar assembly.

Setting the Oxygen Pressure Regulator

To set oxygen pressure regulator R-1 to maintain 160 psig with 1800 psig supply pressure applied, proceed as follows:

CAUTION

Valves V-2, V-5, V-6, V-7, and V-10 are metering (needle) valves. Overtightening these valves will damage the valve seat. Only finger-tight pressure should be used when you close these valves.

1. Ensure that all test stand valves are closed, and plug the bell jar bottom coupling C-1.

WARNING

When you work with oxygen, make certain that clothing, tubing fittings, and equipment are free of oil, grease, fuel, hydraulic fluid, or any combustible materials. Fire or explosion may result when even slight traces of combustible material come in contact with oxygen when it is under pressure.

2. Open the oxygen supply cylinder valve.

NOTE: When you set regulator R-1, a minimum of 1800 psig of oxygen pressure shall be applied to the regulator.

3. Open the test pressure gage-to-bell jar valve V-2 slowly, and fully open the oxygen supply valve V-6.

4. Loosen the hex locknut located on the front of regulator R-1. Turn the T-handle until 160 psig registers on the test pressure gage PG-1. Tighten the hex locknut and your oxygen pressure gage is now set.

5. Close the oxygen supply cylinder valve and open the system bleed valve V-5 to bleed pressure from the system. After bleeding the pressure, remove the plug from the bell jar bottom coupling C-1.

Leakage Test, Accessories Section

To perform the leakage test on the accessories section of the test stand, proceed as follows:

1. Install the nipple assembly in the bell jar bottom coupling C-1. Connect one end of the hose to the adapter, and the other end to the differential pressure connection NIP-7.

2. Ensure that the test pressure gage-to-bell jar valve V-2 is open. The system bleed valve V-5, the test pressure gage build-up and the vent valve V-10 and the differential pressure bleed valve V-7 are closed.

3. Open the differential pressure shutoff valve V-8 and the oxygen supply cylinder valve.

4. Slowly open the oxygen supply valve V-6 until 160 psig is indicated on test pressure gage PG-1.

5. Now close the oxygen supply valve V-6. Leakage will be indicated by a drop in pressure on PG-1. Leakage should not be more than 2 psig in 10 minutes.

6. Leave all hoses and valves in their present position and start your test stand leakage test.

Leakage Test, Test Stand

To perform the leakage test on the entire test stand proceed as follows:

1. Open the converter supply flow control valve V-9 and test pressure gage build-up and the flow valve V-10.

2. Plug the converter supply outlet NIP-5 and the supply converter connection NIP-6. Ensure that the system bleed valve (V-5) is closed.

3. Open the supply valve V-6 until the relief valve RV-11 unseats. (The relief valve is set to relieve at approximately 110 psig, and be

Table 13-2.—Troubleshooting chart

TROUBLE	PROBABLE CAUSE	REMEDY
0-160 psig pressure gage (PG-1) indicates low consistently	Leaky fittings	Perform leak test as instructed in NAVAIR 13-1-6.4 and tighten fittings as necessary.
0-160 psig pressure gage (PG-1) indicates high	Pressure gage (PG-1) pointer not zeroed	Request onsite metrology calibration team to adjust pressure gage zero.
0-160 psig pressure gage (PG-1) pointer pegs	Pressure regulator (R-1) setting incorrect	Adjust regulator setting as instructed in NAVAIR 13-1-6.4.
(59A120 only) 0-15 psig pressure gage (PG-4) indicates low consistently	Leaking fittings	Perform leak test as instructed in NAVAIR 13-1-6.4 and tighten fittings as necessary.
(59A120 only) 0-15 psig pressure gage (PG-4) indicates high	Pressure gage (PG-4) pointer not zeroed	Request onsite metrology calibration team to adjust pressure gage zero.
0-100 in H_2O differential pressure gage (DF-1) indicates high	Pressure gage (DF-1) pointer not zeroed	Request onsite metrology calibration team.
0-100 in H_2O differential pressure gage (DF-1) indicates low	Leaky shut-off differential pressure valve (V-8)	Perform leak test as instructed in NAVAIR 13-1-6.4 and tighten fittings or replace valve.
Linear flow element (FLM 1, 2, 3, or 4) indicates low consistently	Defective flow element	Request onsite metrology calibration team to recalibrate flow element.
	Defective flowmeter indicator (PG-2)	Check flowmeter indicator (PG-2) for leaks or friction.
Flow element (FLM 1, 2, 3, or 4) indicates correctly over part of scale only	Defective flow element	Request onsite metrology calibration team to recalibrate flow element.
	Defective flowmeter indicator (PG-2)	Check flowmeter indicator (PG-2) for leaks or friction.

leak-tight at 100 psig.) Using the system bleed valve V-5, decrease pressure until 100 psig is indicated on test pressure gage PG-1. Close valve V-6. Leakage will be indicated by a drop in pressure on PG-1. Leakage should be no more than 10 psig in 10 minutes.

4. Bleed the test stand by opening the system bleed valve (V-5). Close all the test stand valves. Remove the plugs from the converter supply outlet NIP-5 and the plug from the supply converter connection (NIP-6).

Bell Jar Assembly Leakage Test

To perform a leakage test on the bell jar assembly, proceed as follows:

1. Remove the hose assembly and the nipple assembly from the bottom bell jar coupling C-1. Disconnect the opposite end of the hose from differential pressure connection NIP-7.
2. Ensure that the differential pressure bleed valve V-7, the test pressure gage-to-bell jar V-2,

and the system bleed valve V-5 are closed. Open the differential pressure shutoff valve V-8.

3. Place the bell jar on the adapter fixture and secure it with a clamp. Now plug the bell jar top coupling C-2.

4. Open the oxygen supply valve V-6 slowly until 100 in. H_2O is indicated on the differential pressure gage DF-1. By closing valve V-6 leakage will be indicated by a drop in pressure on DF-1. There shall be not more than 2 in. H_2O in 10 minutes.

5. Close the oxygen supply cylinder valve and open the system bleed valve V-5 to bleed the system.

6. Secure all test stand valves. Leave the system bleed valve V-5 open.

CAUTION

When the test stand is secured, all valves with the exception of the system bleed valve V-5 must be closed. Valve V-5 is left open to prevent the accidental build-up of pressure in the system.

CLEANING

Clean all external parts, test adapters and connections, gage glasses, bell jar, O-ring, and terminals of the liquid oxygen quantity gage capacitor-type tester with a soft, lint-free cloth. The cloth may be dampened with oxygen cleaning compound (MIL-C-81302).

PERIODIC INSPECTIONS

Periodic leakage inspections are required to be performed weekly or after 50 hours of use; and monthly, or after 250 hours of use, whichever occurs first. In addition to the inspection requirements the test stand should be visually inspected for cleanliness, freedom from oil and grease, missing or damaged parts and general condition.

TROUBLESHOOTING

Refer to table 13-2, Troubleshooting Chart for probable trouble causes and remedies. Information in this chart is intended primarily to aid Oxygen Shop personnel in diagnosing problems most likely to be encountered in their daily use of the test stand. Refer to NAVAIR 17-15BC-20 for parts removal and replacement.

Upon completion of any maintenance actions, complete the maintenance forms outlined in the NAVAIR 13-1-6.4.

CHAPTER 14

LIQUID OXYGEN CONVERTERS

The Liquid Oxygen Converter Assembly discussed in this chapter is a GCU-24/A, P/N 10C-0016-10 (see figure 14-1) manufactured by Essex Cryogenics, Inc. (FSCM 19062). Information concerning other types can be found in NAVAIR 13-1-6.4. The converter assembly is designed to store and convert liquid oxygen (LOX) into gaseous oxygen for the aircrewman during flight. Table 14-1 contains the leading particulars for the converter assembly.

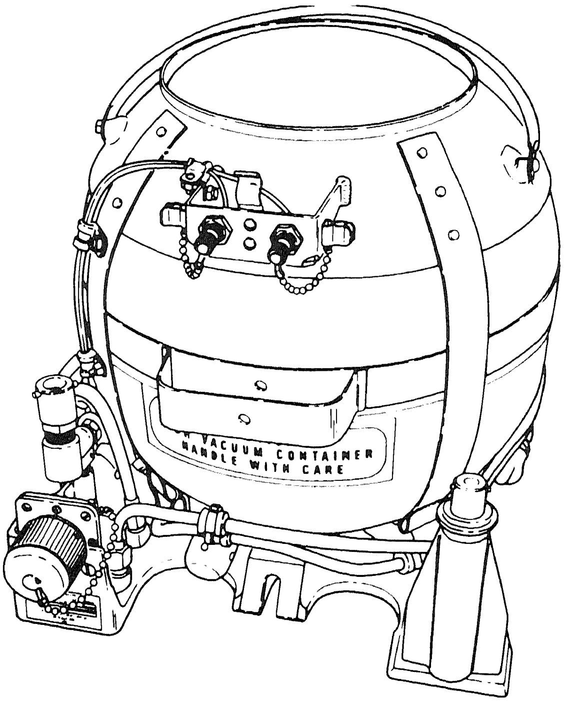


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Figure 14-1.—Liquid oxygen converter assembly, Type GCU-24/A, P/N 10C-0016-10.

Oxygen in its liquid state (approximately −297 °F or −182 °C) is stored in a spherical assembly consisting of inner and outer shells separated by an annular space. The annular space is evacuated to create a vacuum. This prevents the transmittal of heat through the annular space. The thermos bottle effect created retards heating and eventual conversion of LOX to gaseous oxygen. Valves, tubing and fittings incorporated in the converter assembly convert LOX to gas and direct its flow at a controlled rate.

CONFIGURATION AND FUNCTION

The type GCU-24/A Liquid Oxygen Converter Assembly (P/N 10C-0016-10) consists of

Table 14-1.—Leading particulars for liquid oxygen converter assembly, type GCU-24/A, P/N 10C-0016-10

Capacity (LOX)	10 liters
Operating pressure	70 psig
Operating temperature ... range	-65 °F (−58.3 °C) to +260 °F (+127 °C)
Relief valve setting.......	100 to 120 psig
Pressure closing .... valve setting	70 to 80 psig
Delivery rate	120 lpm (min)
Filling time at 70 °F ...... (max)	10 min. at 30 psig
Buildup time (max)	5 min.

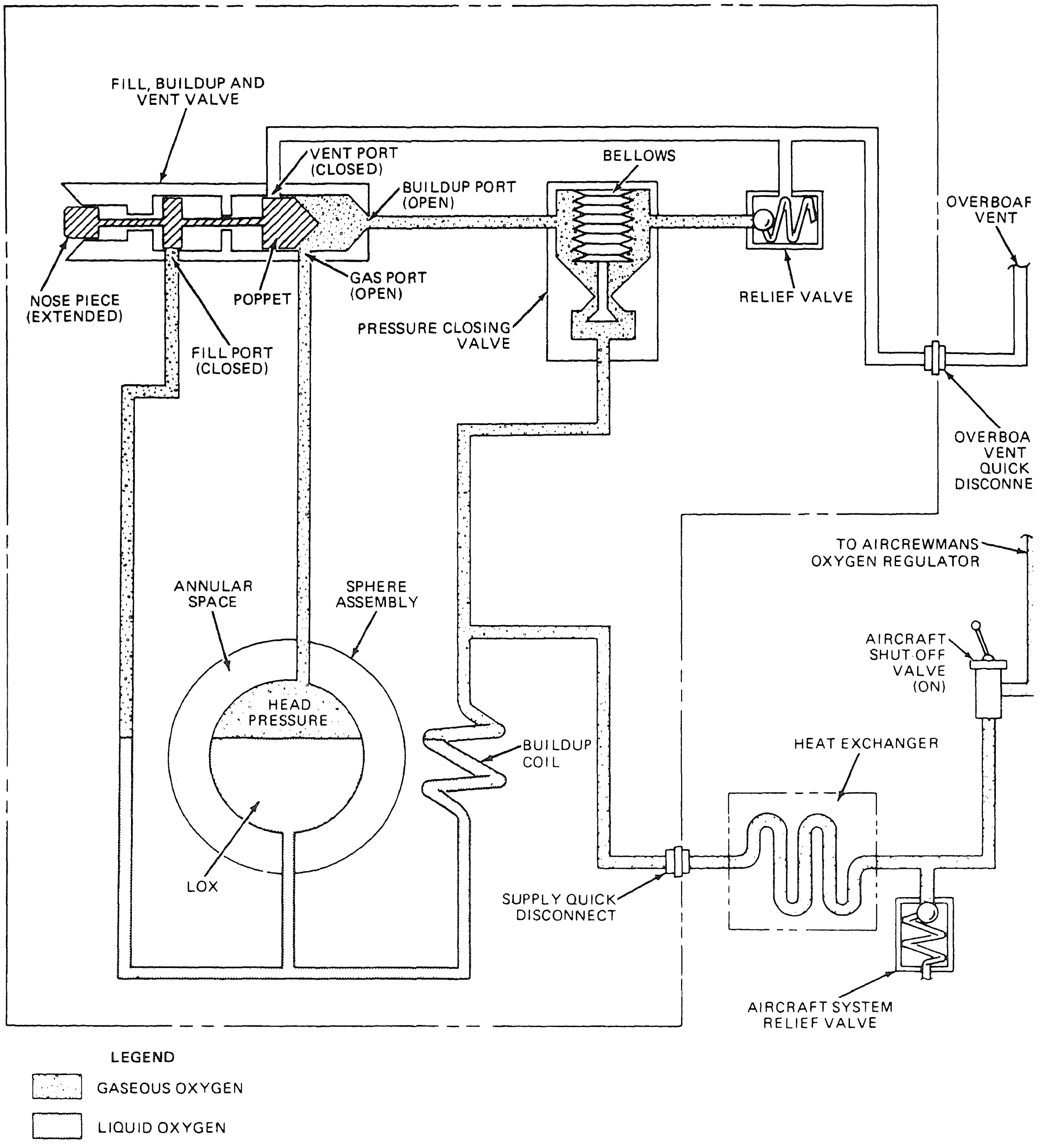

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Figure 14-2.—Buildup and supply mode (converter installed).

a sphere assembly, buildup and vent valve, relief valve, pressure closing valve and associated tubing and fittings. A capacitance-type probe assembly, which sends an electrical signal to a liquid oxygen quantity gage located in the aircraft, is incorporated within the sphere assembly. The quantity gage indicates the amount of LOX, in liters, contained in the converter.

Operation and performance characteristics of the GCU-24/A converter assembly (P/N 10C-0016-10) are as follows:

1. The converter is filled by attaching the LOX servicing trailer filler valve to the filler port of the fill, buildup and vent valve on the converter. When attached, the servicing trailer filler valve depresses the nosepiece and valve poppet of the fill, buildup and vent valve. This automatically puts the converter into the fill mode (see figure 14-2). Figure 14-3 shows the converter installed in an aircraft.

2. With the poppet depressed, the fill and vent ports of the valve are opened, and the buildup port is closed. This condition allows gas pressure built up in the inner sphere to vent to the atmosphere. As pressure is vented, LOX in the servicing trailer (which is at a greater pressure—30 psig), flows through the fill, buildup and vent valve and into the converter.

3. As the LOX level rises in the sphere, pressure created by vaporization of liquid due to

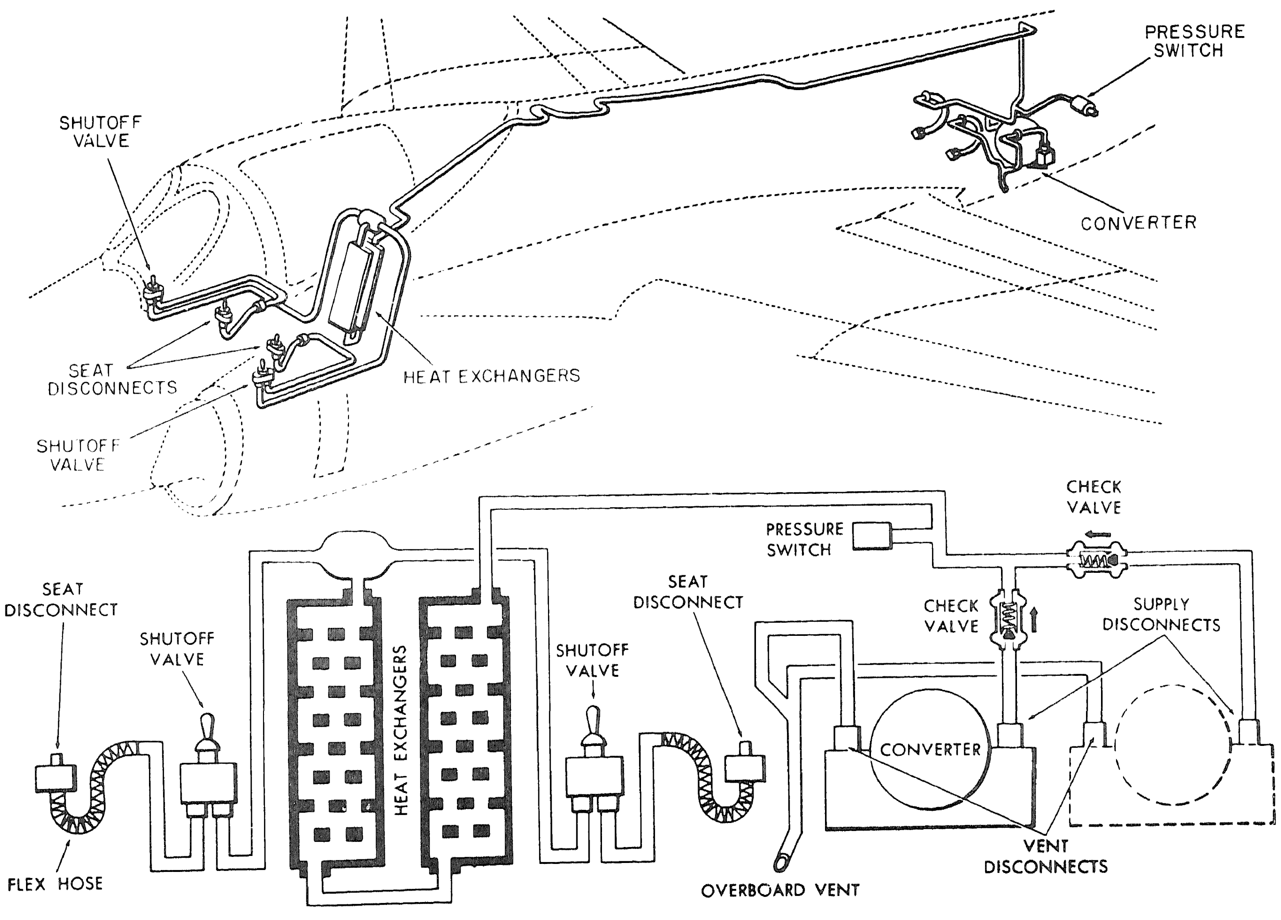

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Figure 14-3.—Converter installed in an aircraft.

heat, turbulence, etc, is vented to the atmosphere. The converter is considered full when LOX flows in a steady stream from the overboard vent line quick-disconnect.

4. When the converter is full and the servicing trailer filler valve is disconnected, the nosepiece and poppet of the fill, buildup and vent valve return to the extended position (see figure 14-2). This automatically puts the converter into the buildup and supply mode by closing the fill and vent ports of the valve, and opening the buildup port.

5. In the buildup and supply mode (see figure 14-2), LOX is forced out of the bottom of the inner sphere and into the buildup coil by the weight of the liquid. As the LOX warms and vaporizes into gaseous oxygen in the buildup coil, pressure is created. This pressure is controlled at approximately 75 psig by the opening and closing action of the pressure closing valve.

6. Gaseous oxygen travels from the buildup coil through the supply quick-disconnect and the heat exchanger to a shut-off valve in the aircraft cockpit.

7. Gaseous oxygen, under pressure, also passes through the gas and buildup ports of the fill, buildup and vent valve to the upper portion of the pressure closing valve, within which is a bellows. This bellows holds the valve in the open position. As pressure builds, the bellows, which senses the increase, contracts (at approximately 75 psig), and closes the valve.

8. Without a demand being placed on the converter, pressure continues to slowly rise. If allowed to go unchecked, pressure in excess of 12,000 psig could be generated. To prevent this potentially hazardous situation, a relief valve is incorporated. The relief valve is set to relieve excess pressure in the converter assembly at approximately 110 psig.

9. As a demand is placed on the converter by the aircrewman, LOX is forced into the buildup coil to replace consumed oxygen. As this process is repeated, the LOX level in the converter drops, increasing the void area at the top. As the size of the void area increases, pressure decreases, and is sensed by the bellows in the pressure closing valve. When pressure falls below approximately 75 psig, the bellows expands, opening the valve. With the valve open, pressure from the build coil passes through the valve and into the top f the converter. This pressure, coupled with t e pressure created by vaporizing LOX contain d in the converter, again builds to approximate y 75 psig and closes the pressure closing valve. Th s process is repeated as long as a demand is bei g placed on the converter.

10. A heat exchanger is incorporated into t e aircraft tubing to further warm the gaseo s oxygen to a breathable temperature.

11. An additional relief valve, set at appro imately 115 psig, is installed in the aircra t oxygen plumbing to provide additional protecti n against overpressurization of the converter a l supply lines of the system.

PERFORMANCE TESTING

To be sure the converter is functioning, a seri of bench tests is made. These tests are ma using the test stand and the test stand calibratio correction cards shown in figure 13-3 in Chapt 13 of this manual.

PERFORMANCE TEST SHEET PREPARATION

Preparation of the Liquid Oxygen Convert Performance Test Sheet (see figure 14-4) whic is used for the performance test and for th bench test described later, requires entering th appropriate indicated flows and pressures i the spaces provided. The indicated flows an pressures shall be extracted from the test stan calibration correction cards (see figure 13-3 c Chapter 13).

The test stand calibration correction car contain all actual flows and pressures require to test all known models of liquid oxyge converters presently in service. Converting actu flows and pressures to indicated flows an pressures is normally accomplished during calibr tion of the test stand. Refer to table 13-2 i Chapter 13 for calibration intervals.

The Performance Test Sheet shall be prepare as shown in figure 14-4. The Performance Te Sheet shown is a sample, but may be reproduce for local use.

PERFORMANCE TEST SHEET
TYPE GCU-24/A LIQUID OXYGEN CONVERTER ASSEMBLY
(ESSEX CRYOGENICS P/N 10C-0016-10)

Date: ______ CONVERTER SERIAL NO: ______ TEST STAND SERIAL NO: ______

OPERATOR: ______________ CDI: ______________ TARE WEIGHT: ______________

1. CONVERTER PURGE (PURGE 45 TO 75 MINUTES AT 200 °F (93 °C) TO 250 °F (121 °C) AND AT A MAXIMUM PRESSURE OF 55 PSIG).
2. INSULATION RESISTANCE TEST (EMPTY)

CONNECTION	MINIMUM ALLOWABLE MEGOHMS	READING
A TO B	2.0	
A TO GROUND	1.0	
B TO GROUND	1.0	

3. CAPACITANCE TEST (EMPTY) READING SHALL BE 121.5 TO 125.5 MICROMICROFARADS (UUF) ________
4. RELIEF VALVE TEST

VENT FLOW					LEAKAGE				
INLET PRESSURE (PSIG)		FLOW			INLET PRESSURE (PSIG)		FLOW		
ACTUAL	INDICATED	ACTUAL (LPM)	INDICATED (IN. H_2O)	READING	ACTUAL	INDICATED	ACTUAL (LPM)	INDICATED (IN. H_2O)	READING
100		100			95		0.01		
120									

5. CONVERTER LEAKAGE TEST

95 PSIG ACTUAL = ________ PSIG INDICATED. WITH INDICATED PSIG APPLIED THERE SHALL BE NO LEAKAGE FROM THE PRESSURE CLOSING VALVE, BUILDUP COIL, TUBING AND FITTINGS.

6. FILL AND BUILDUP TIME TEST
   A. FILL TIME (MAXIMUM TIME ALLOWED IS 10 MINUTES) ________
   B. BUILDUP TIME (MAXIMUM TIME TO BUILDUP TO 70 PSI IS 5 MINUTES) 70 PSIG ACTUAL = ______ PSIG INDICATED. TIME REQUIRED FOR BUILDUP ______ MINUTES
7. CAPACITANCE TEST (FULL)

TOTAL CONVERTER WEIGHT	
CONVERTER TARE WEIGHT	
LOX WEIGHT (W)	
$2.33 \times W + 124.7 = C$ (MAX)	
$2.25 \times W + 122.3 = C$ (MIN)	
READING	
C = CAPACITANCE IN UUF W = WEIGHT OF LOX IN POUNDS	

Figure 14-4.—Converter performance test sheet (Sheet 1 of 2).

8. EVAPORATION LOSS TEST (BUILDUP AND SUPPLY MODE) MAXIMUM ALLOWABLE LOSS OF LOX IN 24 HOURS IS 3.0 LBS.

NOTE: LOX IN CONVERTER MUST BE STABILIZED FOR 1 HOUR PRIOR TO BEGINNING TEST. DO NOT AGITATE CONVERTER DURING 24 HOUR PERIOD.

A. START TIME ____________ START WEIGHT ____________

B. FINISH TIME ____________ FINISH WEIGHT ____________

9. EVAPORATION LOSS TEST (VENTED MODE)
MAXIMUM ALLOWABLE LOSS OF LOX IN 24 HOURS IS 5.0 LBS. (PERFORMED ONLY IF CONVERTER FAILS EVAPORATION LOSS TEST IN BUILDUP AND SUPPLY MODE)

A. START TIME ____________ START WEIGHT ____________

B. FINISH TIME ____________ FINISH WEIGHT ____________

10. FLOW TEST (120 LPM WHILE MAINTAINING 55 TO 95 PSIG WORKING PRESSURE)

WORKING PRESS. (PSIG)		FLOW (LPM)		
ACTUAL	INDICATED	ACTUAL	INDICATED	READING
55		120		
90				

11. CONVERTER CHARGE

PRESSURE (PSIG)		
ACTUAL	INDICATED	READING
25		
30		

Figure 14-4.—Converter performance test sheet (Sheet 2 of 2).

The following tests require the extraction of appropriate indicated flows and/or pressures from the test stand calibration correction cards (figure 13-3 of Chapter 13).

Relief Valve Test

Converter Leakage Test

Fill and Buildup Time Test

Flow Test

Converter Charge

RELIEF VALVE

The relief valve shall vent at least 100 liters per minute (lpm) with an applied pressure of 100 to 120 psig. The maximum allowable leakage with 95 psig applied is 0.01 lpm. Make the following entries on the performance test sheet:

1. Locate the indicated inches of water (in. H_2O) for 100 lpm on correction card number 4. Enter indicated in. H_2O in space provided on the performance test sheet.
2. Locate the indicated psig for the actual pressures of 95, 100 and 120 psig on correction card number 2. Enter indicated psig in space provided on performance test sheet.
3. Locate the indicated in. H_2O for the actual flow of 0.01 lpm on correction card number 7. Enter the indicated in. H_2O in space provided on performance test sheet.

CONVERTER LEAKAGE

The converter leakage test is performed with the converter pressurized with gaseous oxygen to 95 psig. Locate the indicated psig for the actual 95 psig on correction card number 2. Enter indicated psig in space provided on performance test sheet.

FILL AND BUILDUP TIME

The time required to fill the converter (10 liters) shall not exceed 10 minutes at a filling pressure of 30 psig.

The time required for the filled converter to buildup to a working pressure of 70 psig shall not exceed 5 minutes from time the servicing trailer filler valve is disconnected from converter. Locate indicated psig for the actual 70 psig pressure on correction card number 2. Enter indicated psig in space provided on performance test sheet.

FLOW

The converter can deliver gaseous oxygen at a flow rate of 120 lpm while maintaining a pressure of 55 to 90 psig. Make the following entries on the performance test sheet:

1. Locate the indicated in. H_2O for the actual flow of 120 lpm on correction card number 4. Enter indicated in. H_2O in space provided on performance test sheet.

2. Locate the indicated psig for actual pressures of 55 and 90 psig on correction card number 2. Enter actual psig in spaces provided on performance test sheet.

CONVERTER CHARGE

Upon completing the bench test, the converter shall be emptied of LOX, purged with nitrogen, and pressurized with gaseous oxygen at 25 to 30 psig. This prevents moisture from entering the converter during shipment/storage. Locate the indicated psig for the actual pressures of 25 to 30 psig on correction card number 2. Enter indicated psig in spaces provided on the performance test sheet.

MAINTENANCE

This Section contains the procedural steps for inspecting, testing, troubleshooting, disassembly, cleaning, repair, assembly and adjusting of the GCU-24/A Liquid Oxygen Converter Assembly (P/N 10C-0016-10).

Procedural steps outlined in this Section are listed under the inspection cycle in which they are required, and in the sequence in which they normally occur.

ACCEPTANCE/TURNAROUND/ DAILY/PREFLIGHT/POSTFLIGHT AND TRANSFER INSPECTIONS

The Acceptance/Turnaround/Daily/Preflight/Postflight and Transfer Inspections consist of a visual inspection followed by a functional test. These inspections and tests are performed along with the aircraft inspection requirements for the aircraft in which the converter is installed. In making the following checks, if you discover any defects, refer to table 14-2 for troubleshooting assistance.

VISUAL INSPECTION

Visually inspect the converter assembly and surrounding area for the following:

1. Freedom from dirt and hydrocarbons.
2. Correct installation and positioning of all components, safety wire, and Glyptal dots.
3. Legibility of all markings.
4. Cracks, dents or other damage to tubing, valves and electrical connections.
5. Corrosion on converter assembly and surrounding areas.
6. Obstructions in aircraft overboard vent line.
7. Security of supply, vent and electrical quick-disconnects.
8. Excessive frosting of converter assembly.
9. Ensure date on converter bench test decal is current (within last 225 days).

FUNCTIONAL TEST

In addition to the scheduled tests, the functional test should also be performed by the AME

Table 14-2.—Troubleshooting (acceptance/turnaround/daily/preflight/postflight and transfer inspections)

Trouble	Probable Cause	Remedy
Converter will not fill	Ice in filler valve or filler line obstructs LOX flow	Thaw filler valve/filler line
Converter does not fill in required time	Filler line not properly purged prior to filling	Purge and cool filler line
	Converter not sub-cooled before filling	Lower pressure in servicing trailer and sub-cool converter
	Filling pressure too low	Increase pressure to 30 psig.
	Defective converter	Replace converter
Frost collects on entire outer jacket of converter	Heat loss due to annular space leakage	Replace converter
Converter will fill only partially (gas only emitted from vent)	Converter not sub-cooled prior to filling	Lower pressure in servicing trailer and sub-cooled converter
System will not build up	Buildup, vent and filler valve defective, or partially open	Replace converter, or thaw valve
	Pressure relief valve open	Replace converter
Oxygen supply consumed too quickly	Converter not completely filled during filling operation	Refill converter
	System leakage	Locate and repair leaks
	Buildup, vent and filler valve partially open, venting gas	Thaw valve
Filler line cannot be disconnected from filler valve	Filler nozzle frozen to filler valve	Thaw nozzle
Low, or no system pressure	System leakage	Locate and repair leaks
	Pressure closing valve out of adjustment	Replace coverter
Quantity gage indicates empty	System empty, defective probes or gage	Refill, replace coverter or gage
LOX system contaminated	Undesirable odors, or moisture	Purge system

whenever a component of the aircraft oxygen system is removed/replaced. As a PR you may be called upon to perform this test. To functionally test the converter assembly and aircraft oxygen system, proceed as follows:

1. Ensure all circuit breakers associated with the LOX quantity indicating system are set. External electrical power must be applied to the aircraft to perform steps 2 and 3 below.

2. Depress oxygen test switch. Check the quantity gage and low warning light for proper operation. Refer to the applicable aircraft Handbook of Maintenance Instructions (HMI) to determine at what quantity (indicated on quantity gage) that the low warning light should illuminate.

3. Release test switch. Ensure gage pointer returns to position registered on gage before depressing. When test is completed, disconnect electrical power for aircraft.

4. Ensure oxygen shut-off valve is in the OFF position.

5. Attach an oxygen mask, regulator and regulator-to-seat kit hose assembly to oxygen supply connection in aircraft.

Table 14-3.—Visual inspection of type GCU-24/A liquid oxygen converter (P/N 10C-0016-10)

Part Nomenclature	Inspect for	Remedy
Identification and performance plates	Legibility, condition and security	Secure in place or replace
Warning and bench test decals	Presence and condition	Replace or apply as required
Handle	Bends and cracks	Replace
Tubing assemblies	Cracks, dents, nicks, scratches, twists and proper clearance. Damaged connectors and tube nuts	Replace damaged tubing assemblies and connectors. Tubing may be slightly bent to maintain a minimum 1/16-inch clearance between other converter components.
Elbow and nipples	Cracks, dents and scratches	Replace
Male quick-disconnects	Visible damage	Replace
Supply manifold assembly	Visible damage	Replace
Fill, buildup and vent valve	Cracks, damaged poppet valve, nosepiece or work helical grooves	Replace
Clamps	Security and condition	Tighten or replace
Pressure relief and pressure closing valve	Cracks or other visible damage. Presence and condition of lock wire on relief valve	Replace. Replace lock wire on relief valve
Mounting strap, mounting cradle and mounting base assembly	Cracks, broken welds, chipped paint or other visible damage.	Replace. Restore finish by painting
Sphere assembly	Excessive dents, chipped paint or other damage. Not to exceed 3/8" deep	Restore finish by painting
Converter assembly	Freedom from dirt, hydrocarbons and corrosion	Clean and/or refinish

6. Turn oxygen shut-off valve to the ON position. There should be a flow of oxygen through the mask.

7. Place the mask against your face and breathe. There should be a slight resistance during exhalation. This resistance is due to the positive pressure feature of the regulator.

8. Upon completing the functional test, turn the oxygen shut-off valve to OFF. Disconnect the regulator-to-seat kit hose from the aircraft supply connection.

If discrepancies are found or suspected, notify Maintenance Control.

Components of the aircraft oxygen system which do not pass inspection and cannot be repaired in the aircraft shall be removed and replaced by Ready For Issue (RFI) components.

CALENDAR INSPECTION

All liquid oxygen converters are given the calendar inspection before they are placed in service, and at intervals not exceeding 225 days thereafter. This interval applies to all converters; aircraft-installed, shop spares and those maintained in a servicing pool.

The Calendar Inspection consists of a visual inspection followed by a bench test. All work shall be performed in a clean, dust-free and oil-free area. Converter assemblies found to be damaged or out of adjustment shall be repaired by replacing or adjusting the discrepant part or parts. After repair, repeat the bench test.

VISUAL INSPECTION

Visually inspect the converter assembly in accordance with table 14-3.

Liquid oxygen converters failing the visual inspection or bench test shall be repaired, if the specific repair is authorized. SM&R codes, define repairable components and levels of maintenance authorized to perform the repairs. Further explanation can be found in the OPNAV 4790.2 (Series) Manual.

SERVICE LIFE

Liquid oxygen converters shall remain in service as long as they continue to function properly.

BENCH TEST

The Bench Test shall be performed using the Liquid Oxygen Converter Test Stand P/N 59A120, 31TB1995-1 or 31TB1995-4. Refer to Chapter 13 for identification of test stand controls and indicators referenced in bench test procedures. Do not attempt to perform any bench test without first becoming thoroughly familiar with the test stand. Use Performance Test Sheet (figure 14-4) when performing the bench test.

The following tools and materials are required for this test:

Quantity	Description	Reference Number
1	Gas/LOX Purging Unit	90000-1, 901760-1 or equivalent
1	Scale (at least 50-lb capacity)	TE 213 or equivalent
1	Gage, Oxygen, 0-200 psig (Refer to NAVAIR 13-1-6.4)	565-3A or equivalent
1	Coupling, Quick-disconnect (female)	199000-1
1	Thermometer, Self Indicating	GG-T-336 Type 2, Class D or equivalent
As Required	Compound, Leak Detection	MIL-L-25567

In the following descriptions, the tests are arranged so they proceed from one test to the next with a minimum of flow changes. Troubleshooting tables accompany many of the tests.

The first step in the bench test is to find the tare weight of the converter. Tare weight is the weight of the complete converter assembly less the weight of the LOX. Proceed as follows:

1. Ensure all LOX has been removed from the converter.
2. Place the converter assembly on scales having at least a 50-pound capacity. Record weight in space provided on performance test sheet.

CONVERTER ASSEMBLY PURGE

As we mentioned before, the converter should be purged before any test. This purging is the key to a trouble free operating converter. Only dry, oil-free nitrogen, Type I, Class 1, Grade A (FED SPEC BB-N-411) is to be used for purging converters. While operating purging unit, you have to wear protective gloves. The discharge fittings can reach temperatures that will cause severe burns if grasped with bare hands.

Before starting to purge the unit, empty it of LOX and allow it to warm to room temperature. Then proceed as follows:

1. Cap the converter quick-disconnect coupling assembly and attach a drain line to the quick-disconnect coupling assembly.
2. Ensure the purge unit power switch is OFF. Connect the purging unit electrical power cable to a suitable electrical power source.
3. Open the N_2 supply cylinder valve and the purge unit inlet valves.
4. Turn the purge unit power switch ON, and allow the unit to warm up approximately 10 minutes.
5. Measure the outlet temperature of the purge unit using a thermometer, GG-T-336, Type 2, Class D or equivalent. Temperature shall be between 200 °F (93 °C) and 250 °F (121 °C) prior to connecting the purge unit to converter.
6. Connect the purging unit to the fill, buildup, and vent valve of converter.
7. Purge the converter assembly. The maximum inlet pressure and temperature shall be 55 psig and 250 °F, respectively. The purge time for 10-liter LOX converters which are at ambient temperature is from 45 to 75 minutes.
8. When purging is completed, turn the purge unit power switch OFF, secure the N_2 supply cylinder valve and the purge unit inlet valves. Disconnect the purge unit from the converter.

NOTE: Should the unit fail a test the first step of the repair action is to repurge the unit.

INSULATION RESISTANCE TEST (EMPTY)

To perform the insulation resistance test, proceed as follows:

1. Secure the empty converter in the rack provided on the test stand countertop.
2. Using the test stand cable assembly, connect the upper terminals of the high capacitance cable assembly to terminals A and B of the Liquid Oxygen Quantity Gage Capacitance Type Tester.
3. Turn the power switch ON and allow the tester to warm up 10 minutes prior to proceeding.
4. Turn the MEGOHMMETER RANGE SELECTOR to its X-1 position.
5. Turn the FUNCTION SELECTOR knob to the A AND B position. Record the reading on the meter in the space provided on the performance test sheet. Reading should not be less than 2.0 megohms.
6. Turn the FUNCTION SELECTOR knob to A TO GROUND and B TO GROUND positions respectively. Record the readings in spaces provided on the performance test sheet. Readings shall not be less than 1.0 megohm in either position.
7. If insulation resistance readings are less than allowed, connect the cable assembly to the lower probe terminals, and repeat steps 5 and 6.
8. If readings are acceptable, replace the high capacitance cable with the low capacitance assembly. Repeat steps 5 and 6. If readings are acceptable, proceed to step 11.
9. If readings continue to be less than acceptable, moisture may still be present in the sphere assembly. Purge the converter and repeat the test.
10. Converter assemblies that fail the Insulation Resistance Test and cannot be corrected by replacing the low or the high capacitance cable assembly or by purging, shall be condemned.
11. Leave all connections unchanged and start the capacitance test (empty).

CAPACITANCE TEST (EMPTY)

To perform the capacitance test, proceed as follows:

1. Turn the CAPACITANCE RANGE SELECTOR knob to the X-10 position.
2. Turn the FUNCTION SELECTOR knob to its CAPACITANCE (UUF) position.
3. Record the meter reading in the space provided on the performance test sheet. Reading shall be 121.5 to 125.5 micro-microfarads (UUF).
4. If this reading is not within these limits, moisture may still be present in the sphere. Purge converter again and repeat the capacitance test.
5. Converter assemblies that fail the capacitance test and cannot be corrected by purging shall be condemned.
6. Turn the power switch off and disconnect the test stand cable assembly.

RELIEF VALVE TEST

To follow this description you will find it helpful to refer back to figure 13-1 of the test stand in Chapter 13. To perform the relief valve test, proceed as follows:

1. Disconnect low and high capacitance cable assemblies from lower probe terminals.
2. Disconnect the buildup tube assembly from the buildup port of the fill, buildup and vent valve, and from the pressure closing valve. Hold the 45° elbows with open end wrench to prevent turning while loosening tube nut connections.
3. Cap 45° elbow in buildup port of fill, buildup and vent valve.
4. Using test stand hose assembly (P/N 59A120-B5-14), connect test stand BELL JAR BOTTOM COUPLING, C-1 to the 45° elbow on converter pressure closing valve.
5. Using the test stand hose assembly (P/N 59A120-B5-52), connect the converter quick disconnect coupling to the test stand FLOWMETER CONNECTION, NIP-4.
6. Turn the FLOWMETER SELECTOR valve V-1 to the 0-150 lpm position. Open the TEST PRESSURE GAGE-TO-BELL JAR valve, V-2.
7. Open the OXYGEN SUPPLY valve, V-6, slowly. Damage to test stand gages could result

Table 14-4.—Troubleshooting (relief valve test)

Trouble	Probable Cause	Remedy
Relieving below 100 psig	Relief valve out of adjustment	Turn adjusting screw counterclockwise
Relieving below 120 psig	Relief valve out of adjustment	Turn adjusting screw clockwise
Relief valve fails to vent 100 lpm	Relief valve out of adjustment	Turn adjusting screw clockwise
Leakage in excess of 0.01 lpm	Relief valve out of adjustment	Turn adjusting screw counterclockwise
Relief valve cannot be adjusted to tolerances	Defective parts	Replace relief valve

from rapid surges in pressure if this valve is opened too rapidly. Pressure applied will be indicated on TEST PRESSURE GAGE, PG-1.

8. The relief valve shall be relieving a minimum rate of 100 lpm, as indicated on the FLOWMETER INDICATOR GAGE, PG-2, with a pressure of 100 to 120 psig, as indicated on the TEST PRESSURE GAGE, PG-1, applied to the converter. Record these readings on the performance test sheet.

9. Using the OXYGEN SUPPLY valve, V-6, and the SYSTEM BLEED valve, V-5, reduce the pressure applied to the converter to 95 psig as indicated on gage PG-1.

10. Disconnect the test stand hose from the FLOWMETER CONNECTION, NIP-4 and reconnect it to the FLOWMETER CONNECTION, NIP-1.

11. Turn the FLOWMETER SELECTOR valve, V-1 to the 0.0-0.25 lpm position.

12. While maintaining 95 psig to the converter with valve V-6, check for leakage indicated on the FLOWMETER INDICATOR, PG-2. Maximum allowable leakage is 0.01 lpm. Record this reading on the performance test sheet.

13. If leakage is excessive, or if the relief valve fails to vent at the required flow and pressure, locate the probable cause using Troubleshooting Chart Relief Valve Test (Table 14-4).

14. Close OXYGEN SUPPLY valve, V-6. Bleed the test stand using SYSTEM BLEED valve, V-5. Close TEST PRESSURE GAGE-TO-BELL JAR valve, V-4.

15. Disconnect both the test stand hose assemblies from the converter and from the test stand.

16. Uncap the 45° elbow which you capped in step 3, and reconnect the buildup tube which you removed in step 2.

17. Reconnect the high and low capacitance cable assemblies which you removed in step 1. At this time, ensure that all safety wired setscrews have the proper Glyptal dots applied.

CONVERTER LEAKAGE TEST

To test the converter for leaks, proceed as follows:

1. Using test stand hose assembly (P/N 59A120-B5-47), connect the test stand BELL JAR BOTTOM COUPLING C-1 to the converter quick-disconnect coupling.

2. Open the TEST PRESSURE GAGE-TO-BELL JAR valve, V-2.

3. Using the OXYGEN SUPPLY valve, V-6, slowly apply 95 psig, as indicated on TEST PRESSURE GAGE, PG-1, to the converter.

4. Maintain 95 psig and inspect for leakage at all connections using leak detection compound (MIL-L-25567). There should be no leakage. If

Table 14-5.—Troubleshooting (converter leakage test)

Trouble	Probable Cause	Remedy
Any fitting connection leaking	Loose connection	Tighten connection
Elbow or nipple fitting leaking	Stripped threads, excessive burrs, deep scratches, inside or outside diameter out of round or loose	Tighten or replace fitting(s)
Tubing leaking	Dents, kinks, deep scratches, twisted tubing, improperly flared ends or damaged connectors	Replace tubing

Table 14-6.—Troubleshooting (fill and buildup time test)

Trouble	Probable Cause	Remedy
Failure of converter to fill in prescribed time	Defective fill, buildup and vent valve	Replace fill, buildup and vent valve
	Pressure closing valve out of adjustment or defective	Adjust or replace pressure closing valve
Failure of converter to reach operating pressure within prescribed time	Pressure closing valve out of adjustment or defective	Adjust or replace pressure closing valve

any leakage is found, locate its probable cause using the troubleshooting chart (Table 14-5).

5. Close OXYGEN SUPPLY valve V-6. Bleed the test stand using SYSTEM BLEED valve V-5. Close TEST PRESSURE GAGE-TO-BELL JAR valve V-2.

6. Remove the converter assembly from test stand.

FILL AND BUILDUP TIME TEST

To perform the fill and buildup time test, it will be necessary to take the converter to a LOX servicing area, or use a LOX servicing trailer in the immediate area of the Oxygen Shop. Any other method is acceptable that meets requirements of the test, and does not violate safety precautions. Remember, LOX requires special precautions.

Once the converter is in a satisfactory location, proceed as follows:

1. Attach a vent drain line to the converter quick-disconnect coupling. This line should be long enough to route venting LOX away from all personnel.

2. Attach the pressure gage/relief valve test fixtures to the supply quick-disconnect coupling (refer to NAVAIR 13-1-6.4).

3. Attach the servicing trailer filler valve to the converter fill, buildup, and vent valve.

4. Note the time, and start filling the converter. Maintain a filling pressure at 30 psig.

5. The converter is full when a steady stream of LOX flows from the drain line. When the converter is full, note the time. The time required to fill the converter at 30 psig should be no longer than 10 minutes. Record the fill time in the appropriate space on the performance test sheet.

6. Note the time, and disconnect and secure the servicing trailer. The time noted at this point is the beginning of the buildup time test.

7. Observe the pressure gage on the quick-disconnect coupling. On the performance test sheet, record the time it takes the converter assembly to buildup to a working pressure of 70 to 80 psig. This time shall not exceed 5 minutes.

8. If discrepancies were noted in either part of the test, locate the probable cause using the troubleshooting chart (Table 14-6).

9. Remove the vent drain line and the pressure gage/relief valve test fixture you installed in steps 1 and 2.

CAPACITANCE TEST (FULL)

The capacitance test requires simultaneous use of the 50-pound scales and the Quantity Gage Capacitance Type Tester incorporated in the test stand. Ensure the scales are positioned close enough to the tester, then proceed as follows:

1. Place the full converter on the scales.
2. Using the test stand cable assembly, connect the upper terminals of the converter high and low capacitance cable assemblies to terminals A and B, respectively of the Liquid Oxygen Quantity Gage Capacitance Type Tester.
3. Turn the power ON and allow the tester to warm up 10 minutes before proceeding.
4. Turn the CAPACITANCE RANGE SELECTOR knob to its 10X position.
5. Turn the FUNCTION SELECTOR knob to the CAPACITANCE (UUF) position.
6. Enter the total weight of the full converter in the space provided on the performance test sheet.
7. Subtract the tare weight of the converter from its total weight. Enter this figure on the performance test sheet. This is the weight of LOX in the converter.
8. Using the formula given on the performance test sheet, $2.33 \times W + 124.7 = C(\max)$ calculate the capacitance maximum (C-max). Use the weight of LOX for W. Enter the result of the calculation in the space provided.
9. Use the following formula $2.25 \times W + 122.3 = C(\min)$ and calculate the capacitance minimum (C-min) on the next line of the test sheet. Use the weight of LOX for W.
10. Observe and record capacitance reading from test stand capacitance gage in space provided on performance test sheet. Reading shall be between C(max) and C(min).
11. If the test is not within these limits and the converter has not been purged in previous tests, there may be moisture in the sphere. Purge the converter and refill it with LOX, then repeat steps 1 through 11.
12. If the converter is still not within limits, condemn the converter.
13. Secure the tester and disconnect the cables from the converter and tester. If the converter passes capacitance test, carefully remove it from the scales and allow it to remain undisturbed for 1 hour.

EVAPORATION LOSS TEST (BUILDUP AND SUPPLY MODE)

To perform the evaporation loss test in the buildup and supply mode, proceed as follows:

1. At the end of the 1 hour period, gently place the converter on the scales and record its weight and the start time in the spaces provided on section 8 of the performance test sheet.
2. Place the converter assembly aside again and allow it to remain undisturbed for 24 hours.
3. At the end of the 24-hour period, carefully replace the converter on the scales.
4. Record the time and weight in the spaces provided on the performance test sheet. The 24 hour weight loss must be less than 3 pounds. There should not be a heavy coat of frost on the sphere.
5. If the weight loss was 3.0 pounds or less, and there was not excessive frosting of the sphere assembly, proceed to the Flow Test. If the loss was more than 3.0 pounds, proceed to the EVAPORATION LOSS TEST.

EVAPORATION LOSS TEST (VENTED MODE)

Maximum allowable loss of LOX in 24 hours is 5.0 pounds. Minimum allowable loss is defined as the weight recorded during the buildup and supply mode minus 0.5 pound (performed only if converter fails evaporation loss test in buildup and supply mode).

To perform the evaporation loss test in the vented mode, proceed as follows:

1. With the converter still on the scales, attach the test stand fill valve adapter (P/N 59A120-D5-10) to the fill, buildup, and vent valve on the converter.

WARNING

Venting a converter that is in a buildup and supply mode causes a blast of LOX from the vent port. Ensure that vent blast is directed away from all personnel, and that adequate clothing and facial protection are worn.

Table 14-7.—Troubleshooting (evaporation loss test)

Trouble	Probable Cause	Remedy
Excessive weight loss (evaporation loss test (vented))	Loss of vacuum in sphere assembly	Replace converter assembly
Excessive weight loss (evaporation loss test (buildup and supply mode))	Excessively leaking valves, leaking tubing and/or fittings	Replace valves, tighten or replace fittings. Repeat converter leakage test
Frosting of sphere assembly	Loss of vacuum in sphere	Replace converter assembly

Table 14-8.—Troubleshooting (flow test)

Trouble	Probable Cause	Remedy
Converter fails to maintain operating pressure	Pressure closing valve out of adjustment	Adjust or replace pressure closing valve

2. Turn the knurled knob of the adapter in until it seats. This places the converter in the vented mode.
3. Record the time and weight in section 9 of the performance test sheet.
4. Place the converter aside and allow it to remain undisturbed in the vented mode for 24 hours.
5. At the end of the 24-hour period, carefully replace the converter on the scales.
6. Record the time and the converter weight on the performance test sheet. Weight loss in 24 hours shall not exceed 5.0 pounds for this test to be satisfactory.
7. If the weight loss is too much, locate the probable cause by using the troubleshooting chart in Table 14-7.
8. Remove the fill valve adapter you installed in step 1.

FLOW TEST

To perform the flow test, proceed as follows:

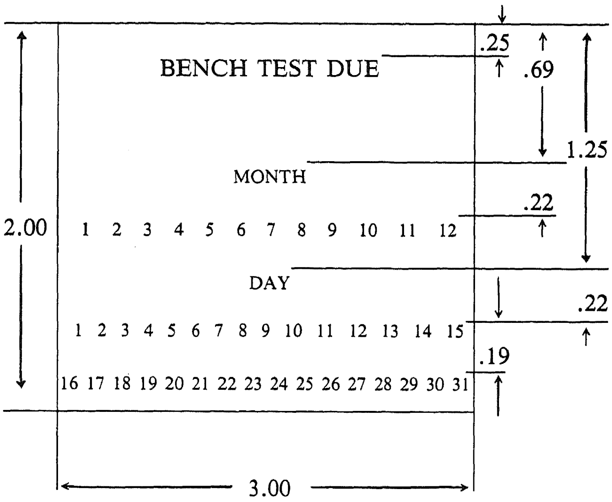
1. Secure the converter in the rack on the test stand countertop.
2. Using the test stand hose assembly P/N 59A120-B5-12, connect the test stand FLOWMETER CONNECTION, NIP-4, to the CONVERTER SUPPLY OUTLET CONNECTION, NIP-5.
3. Using the test stand hose assembly P/N 59A120-B5-47, connect the test stand SUPPLY TO CONVERTER CONNECTION, NIP-6, to the converter quick-disconnect coupling.
4. Place the test stand FLOWMETER SELECTOR valve V-1 in the 0-150 lpm position. Open the TEST PRESSURE GAGE BUILDUP AND FLOW valve V-10. You should not have a reading of over 70 psig on the test pressure gage PG-1. If the test pressure gage reads over 70 psig, vent the converter system pressure to 70 psig (refer to NAVAIR 13-1-6.4).
5. Open the test stand CONVERTER SUPPLY FLOW CONTROL valve V-9, to give a flow of 120 lpm as indicated on the FLOWMETER INDICATOR gage, PG-2. Maintain the flow for a minimum of 15 minutes.
6. While maintaining a 120 lpm flow, the converter should maintain pressures of 55 to 90 psig as indicated on the TEST PRESSURE gage, PG-1. Record the high and low pressures in the indicated blocks in section 10 of the performance test sheet.
7. If the converter supply pressure is not within limits, locate probable cause using the troubleshooting chart (Table 14-8).
8. Continue flowing the converter until it is completely empty of LOX. Any means of evacuating LOX from the converter is acceptable, provided all safety precautions are followed.

9. Disconnect the test stand hose assemblies which you attached in steps 2 and 3. Close all test stand valves.

CONVERTER CHARGE

Upon completion of the bench test, the converter shall be charged with gaseous oxygen to 25 to 30 psig to prevent entry of moisture and other contaminants during shipment/storage. To charge the converter, proceed as follows:

1. Secure the converter in the rack on the test stand countertop, unless it is already there.
2. Using the test stand hose assembly P/N 59A120-B5-47, connect the test stand BELL JAR BOTTOM COUPLING, C-1, to the converter quick-disconnect coupling.
3. Open the TEST PRESSURE GAGE-TO-BELL JAR valve, V-2.
4. Opening the OXYGEN SUPPLY valve, V-6, slowly charge the converter to 25 to 30 psig. Pressure will be indicated on the TEST PRESSURE gage, PG-1.
5. Close the OXYGEN SUPPLY valve, V-6; disconnect the hose assembly connected in step 2, and bleed the test stand using SYSTEM BLEED valve, V-5. Secure all test stand valves.
6. At this point, enter the amount of the converter charge in section 11 of the performance test sheet, and you and a CDI sign the sheet. The original, or a copy of the performance test sheet is forwarded to the operational custodian of the converter.
7. Mark due-date of next bench test on the bench test decal (figure 14-5). Due date is 225 days from the last bench test date. Affix this decal to the converter in a position in which it will be visible when the converter is installed in an aircraft.
8. Install dust covers or plugs in/on all open couplings prior to shipping or storage of the converter.



NOTES.
1. MATERIAL SHALL BE ELASTOMERIC PRESSURE SENSITIVE TYPE ADHESIVE BACKED, IN ACCORDANCE WITH MIL-M-13719, TYPE 1, CLASS 1.
2. ALL LETTERS AND NUMBERS SHALL APPROXIMATELY MATCH GREEN NO. 14187 OF FED. STD. NO. 595; BACKGROUND SHALL APPROXIMATELY MATCH WHITE NO. 17875 OF FED. STD. NO. 595.
3. BENCH TEST DUE SHALL BE 18 POINT GOTHIC (SANS SERIF) LETTERING. ALL OTHER NUMBERS AND LETTERS SHALL BE 10-POINT, GOTHIC (SANS SERIF).

Figure 14-5.—Bench Test Decal.

CHAPTER 15

RIGID SEAT SURVIVAL KIT

DESCRIPTION

The Rigid Seat Survival Kit-8 Series (RSSK-8 Series) is designed for use with Douglas ESCAPAC ejection seats and functions as a seat cushion for the aircrewman as well as a container for an emergency oxygen system, liferaft and survival equipment (shown in figures 15-1 and 15-2). There are three manufacturers of these kits—Rocket Jet Engineering Corp., Scott Aviation Corp., and East-West Industries. The illustrations in this chapter show the latest configuration of the RSSK-8 manufactured by Scott Aviation Corporation.

The RSSK-8 has a bonded fiberglass body and an extruded metal lip interconnecting the upper and lower containers. The upper container houses the emergency oxygen supply; the lower container,

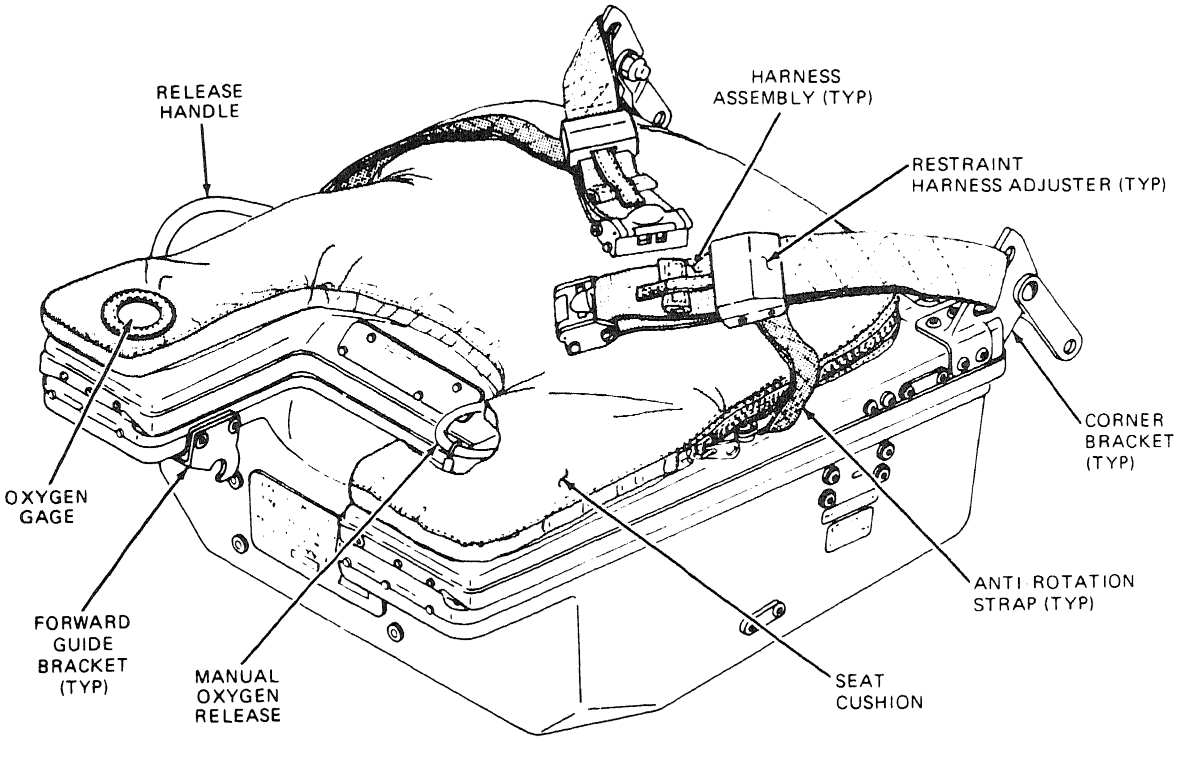


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Figure 15-1.—RSSK-8 closed.

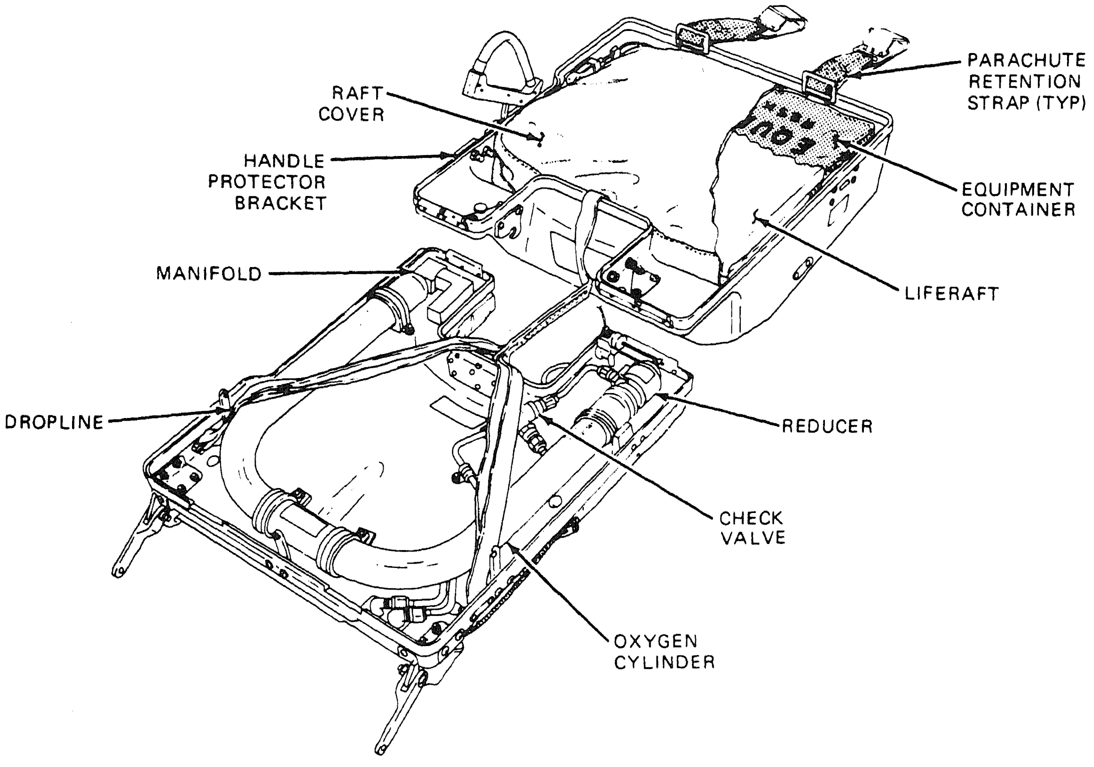

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Figure 15-2.—RSSK-8 open.

the liferaft and survival equipment. The kit is opened by the yellow handle mounted on the forward right side. Two adjustable retaining straps, permanently mounted on the upper container, provide attachment of the kit to the aircrewman's torso harness. A flexible oxygen and communications hose installed on the aft left side of upper container connect the aircrewman to the aircraft for communications and oxygen functions. In the event of a failure of the aircraft oxygen system, emergency oxygen is available by pulling the manual oxygen release on the kit. Oxygen from the kit then flows to the aircrewman through the emergency oxygen system reducer in the kit. A check valve in the oxygen line prevents emergency oxygen from flowing into the aircraft system or overboard from the kit. When the aircrewman ejects, the reducer is automatically operated by a lanyard connected between the actuator and aircraft.

When he sits in the aircraft, the aircrewma connects the kit quick-release fittings to hi retaining straps on his torso harness. He also connects his oxygen mask and communication hos to the seat pan quick-disconnect fitting. This hos can be quickly disconnected by pulling sharply o the hose assembly.

FUNCTION

The RSSK-8 is a part of the surviva equipment used by aircrewmen aboard th types of aircraft listed in table 15-1. A you can see, these are high performanc aircraft which can operate at high altitudes Therefore, in addition to containing surviva gear, the kit also furnishes oxygen to th aviator when he ejects at altitudes wher there is not enough oxygen to maintain consciousness.

Table 15-1.—RSSK-8 application

Escape System	IC-2	IC-3	IF-3	IG-2	IG-3	IE-1
Aircraft	A-7A	A-4F	A-4F	A-7A	A-4F	S-3A
	A-7B	A-4M EA-4F	A-4M	A-7B	A-4M	(See Note)
	A-7C	TA-4F	TA-4F	A-7C	TA-4F	
	A-7E	TA-4J	TA-4J	A-7E	TA-4J	
	A-7H			A-7H		
NOTE:	Survival kits used in S-3A Type A/C must be updated to provide compatibility with AIC-14 Intercommunication Systems and the Integrated Communication Control System.					

When the aircrewman ejects from the aircraft, the following events occur:

The automatic actuation lanyard for the emergency oxygen system actuates the reducer assembly at seat ejection. The aircrewman is then supplied emergency oxygen for descent (see figure 15-3. If automatic actuation of the emergency oxygen system fails, the emergency oxygen system may be actuated by the aircrewman by means of the manual oxygen release (green ring). The radio beacon is automatically actuated by another actuation lanyard. The beacon provides a continuous signal during descent.

When a safe altitude is reached, the aircrewman pulls the kit release handle free of the kit. This unlocks the containers and the lower half falls away but remains attached by the dropline assembly. The liferaft, attached to the dropline, is automatically inflated.

INSPECTIONS

Your concern with this unit is mainly in inspecting it at scheduled intervals or when damage might be suspected. There are three types

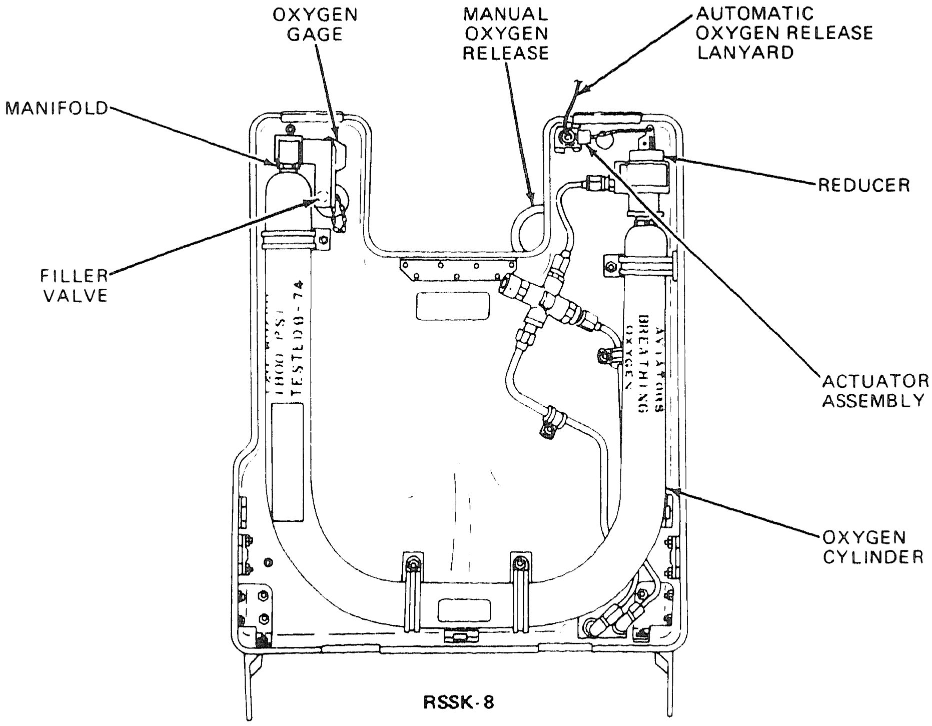

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Figure 15-3.—Emergency oxygen schematic.

of inspections made at routine intervals: the Turnaround/Daily/Preflight/Postflight/Transfer, Special Inspections and the more detailed Acceptance/Phased/SDLM Inspections. In addition, Conditional Inspections are unscheduled inspections required as the result of a specific situation or set of conditions, e.g., hard-landing inspections or any inspection directed by higher authority that is not ordered in a technical directive.

The Turnaround/Daily/Preflight/Postflight or Transfer Inspections consist of a visual-type inspection performed in conjunction with the aircraft inspection requirements for the aircraft in which the survival kit is installed. These inspections are performed by line personnel (plane captain) or delegated aircrewmen who have been instructed and found qualified by the Aviator's Equipment Branch.

The Special (seven/fourteen day, etc.) Inspections are performed on inservice survival kits installed in aircraft or in ready room issue. These inspections are done at the Organizational Level of maintenance by personnel assigned to the Aviator's Equipment Branch. The date of these inspections and inspector's signature are recorded in the inspection section of the Aviation Crew Systems History Card.

To perform the Turnaround/Daily/Preflight/Postflight/Transfer or Special Inspections, visually inspect the following:

1. Cushion for secure attachment, rips, tears, and loose or grayed stitching.
2. Release handle for proper seating and corrosion.
3. Oxygen gage for FULL indication.
4. Emergency oxygen lanyard coupling assembly for spring security.
5. Emergency oxygen lanyard for proper installation and corrosion.
6. Manual emergency oxygen release for condition and security of attachment.
7. Container assembly for cracks, breaks, and other obvious damage.
8. Harness assemblies for loose or frayed webbing, stitching, and cracked or broken hardware.
9. Lapbelt release assembly for loose or missing screws and corrosion.
10. Beacon actuator indicator for bent sha t, hairpin cotter for elongation and corrosion.
11. Secure attachment of beacon automa ic actuation lanyard (if installed).
12. Seal decal for secure attachment, tea s, or rips. If the seal decal is damaged, the RS K must be reclosed by IMA.
13. Condition of oxygen hose and secu e attachment to kit. If repair procedure has be n performed on the oxygen hose assembly, che k external wiring for secure attachment.
14. (S-3A A/C) Secure attachment of ext nally mounted electrical cable assembly to oxyg n hose assembly.

If any parts must be replaced, note that simi r parts from kits made by different manufactur s are not interchangeable. Attempts to substit e one manufacturer's part for another may ca e the kit to malfunction. Make sure the parts a d assembly lists are for the proper kit wh n servicing a kit, or ordering replacement co ponents for it.

If discrepancies are found or suspecte , Maintenance Control shall be notified.

Survival kit assemblies which do not pa s inspection and cannot be repaired in the aircra t shall be removed and replaced by Ready for Iss e (RFI) survival kits. Non-RFI survival kits sha l be forwarded to the nearest maintenance activi y having repair capability.

ACCEPTANCE/PHASED/SDLM INSPECTIONS

The Acceptance Inspection is performed wh n the survival kit is placed into service. When a su vival kit is an aircraft inventory item, the Accep ance Inventory Inspection and Packing shall ser e as the Acceptance Inspection. In this case, th records concerning the RSSK shall be examine . Phased/SDLM Inspection cycle of a survival k corresponds to the aircraft Phased/SDL maintenance inspection cycle as scheduled by th Planned Maintenance System. In no cases sha the phased interval exceed 225 days.

Visual Inspection

This inspection shall be performed prior to the functional check of the kit. Visually check the kit for the following:

1. The cushion for rips, tears, and general condition.
2. The release handle for wear, corrosion and damage.
3. The manual emergency oxygen release handle (green ring) for damage and security of attachment.
4. The upper and lower container for cracks, corrosion, and security of hardware.
5. Webbing for loose or frayed stitching and security of attachment.
6. The lapbelt release assembly for loose or missing screws and corrosion.
7. Swaged balls on cable assemblies for security of attachment. The swaged ball pull test is performed during the Acceptance Inspection only.

Swaged Ball Pull Test

To check swaged ball attachment to cable assemblies perform the following pull test:

Materials Required

Nylon Cord, Type II Scale (at least 100 lb capacity)

1. Remove four screws and cover from assembly.

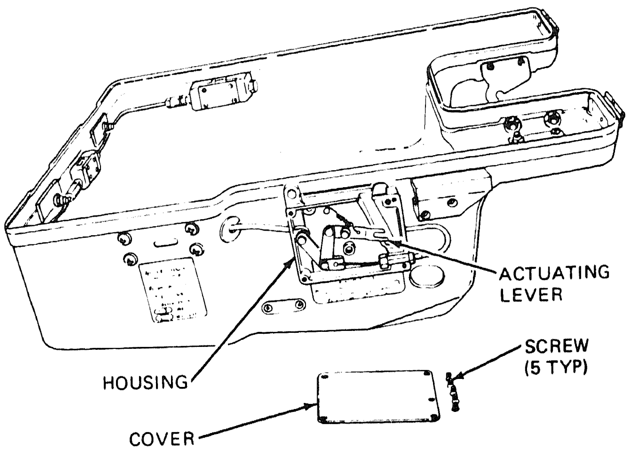

Figure 15-4.—Pushing actuating lever down.

2. Push actuating lever down (figure 15-4).

3. Remove spring and two spacer pins. Lift actuating lever assembly with cable inserted in clevis from housing (figure 15-5).

4. Thread approximately 5 inches of nylon cord MIL-C-5040 through "LINKS" and tie both ends together (figure 15-6).

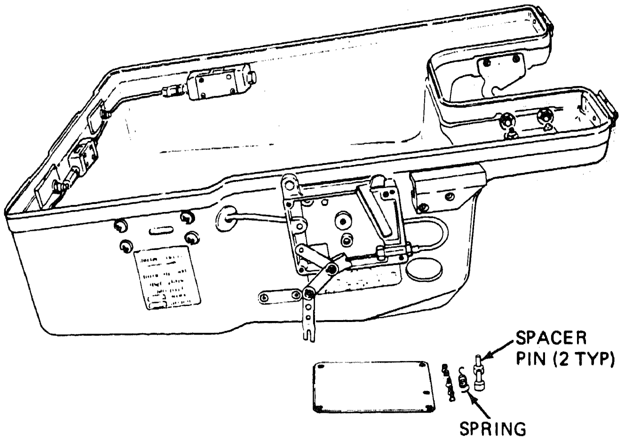

Figure 15-5.—Removing spring and spacer pins.

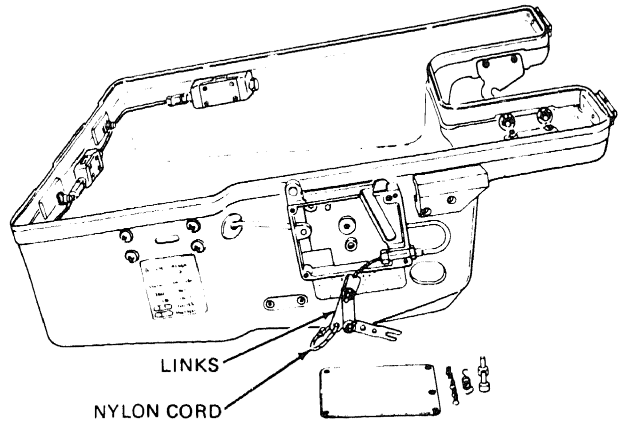

Figure 15-6.—Tying links together.

5. Insert hook of scale into loop of nylon cord (figure 15-7).

6. Pull the scale towards aft direction of kit and in the normal direction of cable operation. Ensure the adjusting sleeve does not move from its housing while pull force is exerted. Ensure that the links and clevis are not pulled from the housing more than 1/2-inch. Swaged balls should withstand 100 pounds pull force (figure 15-8).

7. If the assembly fails to meet the specified pull force, slide the ball off the cable and swage a new ball in the same location.

8. Assemble the parts and install the cover on the housing.

Functional Check

This check shall be performed at each Acceptance/Phased/SDLM Inspection. It shall also be performed after any adjustment procedures. Refer to Troubleshooting Chart (table 15-2) prior to making any adjustments.

Materials Required

Test Stand 59A120
Scale (0 to 50 pounds)
Leak Detection Compound
Toggle Reset Tool

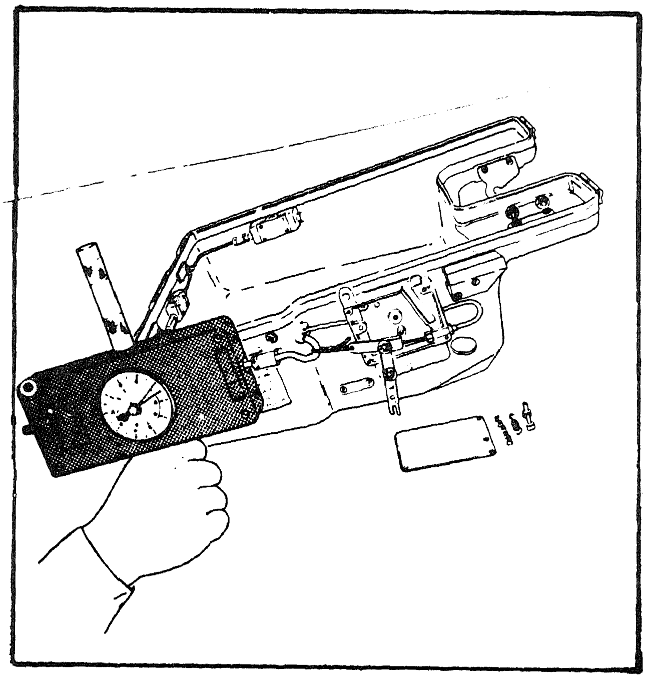

Figure 15-7.—Attaching scale to nylon loop.

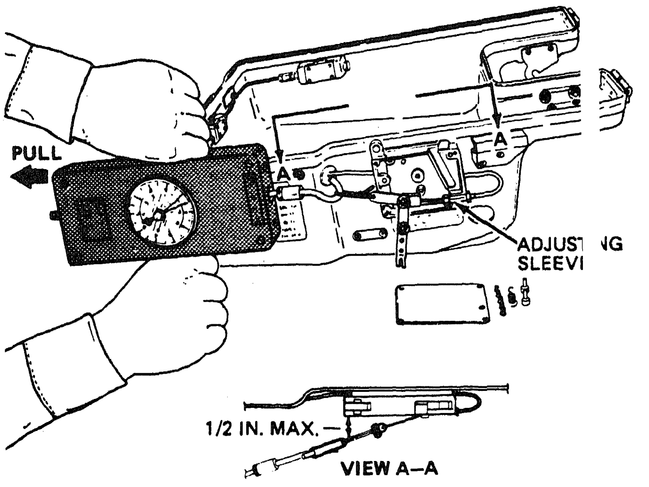

Figure 15-8.—Testing swage balls.

Inspect leak detection compound befc e using it. Compound which is not clear and fr e from suspended material or sediment is consider d contaminated and shall be disposed of. Coi -pound exhibiting peculiar odors such as aceto e or alcohol is considered contaminated and sh l be disposed of.

Emergency oxygen cylinder pressures used this functional test are taken under ideal shop co -ditions of 70°F or 21°C. Variances in temperatures directly affect charging pressure. Refer to table 15-3 for details.

Ensure that the emergency oxygen cylind is filled to 1800 to 2000 psi, corrected pre sure.

1. Connect the oxygen outlet hose of the k to the bell jar coupling C-1 (figure 13-1 in Chapt 13) and ensure that valve V-2 is open and all oth test stand valves are closed.

2. Attach the pull scale to the manu emergency oxygen release handle, and test f disengagement force. Ensure the manual oxyge release is of the separating type before attemp ing to disengage it.

3. Measure the force required to disengage tl manual oxygen release. This should be 10 to 3

Table 15-2.—Troubleshooting

Trouble	Probable Cause	Remedy
Low or zero pressure indication on oxygen gage.	Oxygen tube empty.	Recharge oxygen system.
	Defective pressure gage.	Replace gage.
	Oxygen system components are leaking.	Tighten connections or replace defective parts as required.
No oxygen flow at kit-to-man hose from aircraft system (emergency oxygen system not actuated).	Defective check valve.	Replace check valve.
Oxygen pressure at kit-to-man hose not within tolerance of 45 to 80 psi when emergency oxygen system actuated during test.	Defective oxygen reducer/manifold.	Replace oxygen reducer/manifold.
	Oxygen reducer/manifold incorrectly adjusted.	Adjust and test reducer/manifold.
Relief Valve Leakage.	Defective Quad-Ring.	Disassemble, remove and replace Quad-Ring P/N 4008 (FSCM 07322).
Relief Valve does not operate within tolerance of 120 to 140 psi when simulated aircraft back pressure is applied during test.	Defective or out of adjustment relief valve.	Adjust relief valve in accordance with NAVAIR 13-1-6.3. If specification cannot be met replace relief valve.
Oxygen flow exists at ship-to-kit hose when emergency oxygen system is actuated during test.	Defective check valve.	Replace check valve.
No oxygen flow at kit-to-man hose when emergency oxygen system is actuated by emergency oxygen lanyard or emergency manual oxygen release.	Upper and lower adjuster or oxygen actuator assembly not adjusted correctly: Oxygen lanyard or manual release pulls free of actuator assembly before reducer/manifold toggle arm is operated by actuator cables.	Adjust oxygen actuator assembly.
Pull force to actuate emergency oxygen system by emergency oxygen lanyard or emergency manual oxygen release is not within tolerance of 10 to 30 pounds.	Excessive or insufficient washers beneath toggle arm of reducer/manifold assembly.	Adjust and test reducer/manifold.
	Foreign matter in actuator.	Clean actuator assembly.
	Expanded diameter of retaining ring on emergency manual oxygen release causing an increased retention load within adjuster of oxygen actuator assembly.	Replace oxygen actuator assembly.
	Burrs and corrosion on grip assembly and adjuster nut.	Polish off burrs and corrosion and lubricate.

Table 15-2.—Troubleshooting—Continued

Trouble	Probable Cause	Remedy
Emergency lanyard coupling assembly loose.	Broken or missing spring.	Repair in accordance th NAVAIR 13-1-6.3.
Operation of handle fails to separate upper from lower container.	Lock actuating cables out of adjustment.	Adjust cables.
	Broken, crushed or bent lock actuating cable assembly.	Replace discrepant cable.
	Damaged lock.	Replace discrepant lock.
	Pin opposite slot on disk in multi-release assembly has sheared (Rocket Jet only).	Replace multi-release assem y.
	Swaged ball slipped off cable.	Install new swaged ball on ca e.
Handle does not release from kit within tolerance of 10 to 30 pounds.	Latch in handle not clearing latch engagement projection on multi-release housing during handle operation.	Adjust position of latch n guide.
	Broken, crushed or bent lock actuating cable assembly.	Replace discrepant cable.
	Damaged lock.	Replace discrepant lock.
Loss of aircraft communications.	Broken or misaligned pins and sockets in hose connectors. Open or short circuit in oxygen hose wiring.	Perform electrical check.

pounds, and the emergency oxygen system should actuate and indicate 45 to 80 psi on gage PG-1 on the test stand.

4. Reinstall the manual oxygen release (if separating type) and reset the reducer.

5. Turn the oxygen supply cylinder to the test stand on.

6. Slowly open valve V-6 on the test stand and adjust the pressure on gage PG-1 to 90 psi.

7. Measure the force required to disengage the manual oxygen release with a scale. This force should be 10 to 30 pounds.

8. Using leak test compound, check all pressure lines and fittings on the kit for leakage. No leakage is allowed.

9. Reinstall the manual oxygen release (if separating type) and reset the reducer.

10. Using valve V-6, increase pressure u til the relief valve unseats. However do not incre se the pressure above 150 psi. Unseating can be determined by listening, and by observing g ge PG-1 on test stand.

11. Repeat step 10 several times to estab sh a correct pressure. Relief valve shall unseat at 20 to 140 psi when pressure is increased, and r et at 110 psi minimum when pressure is decrea d. The pressure is reduced below the open g pressure of the relief valve by closing valve -6 and opening bleed valve V-5. Once reset, the re ef valve shall be leak tight.

12. Check the relief valve with leak test sc ution. No leakage is allowed.

13. Close valve V-6 and bleed oxygen press re from the system by opening valve V-5. ll pressure is bled when gages PG-1 and P -4 indicate zero pressure.

Table 15-3.—Ambient air temperature vs charging pressures

Ambient Air Temperature		Charging Pressure
°F	°C	PSI
0	−18	1550-1750
10	−12	1600-1775
20	−7	1625-1800
30	−1	1675-1850
40	5	1700-1875
50	10	1725-1925
60	16	1775-1975
70	21	1800-2000
80	27	1825-2050
90	32	1875-2075
100	38	1900-2125
110	43	1925-2150
120	49	1975-2200
130	54	2000-2225

14. Close valve V-5.

15. Ensure that bleed valve V-2 is opened and all other test stand valves are closed.

16. Measure the force required to disengage the automatic oxygen release with a scale. This force should be 10 to 30 pounds when it disengages, the emergency oxygen system should actuate and indicate 45 to 80 psi on gage PG-1.

17. Reset the reducer.

18. Open valve V-5 to bleed pressure.

19. When pressure is bled, as indicated by no indication on gages PG-1 and PG-4, close valve V-5. Now, observe gage PG-4 for 2 minutes. Any pressure rise indicates leakage in the valve seat of the reducer/manifold.

20. Open valve V-5 and close valve V-2.

21. Disconnect the oxygen hose from fitting C-1.

22. Ensure all valves on the test stand are secured.

23. Connect the oxygen outlet hose to fitting NIP-6. Ensure that valve V-10 is open and all other test stand valves are closed.

24. Connect the test stand hose between fitting NIP-5 and fitting NIP-4.

25. Move valve V-1 to the NIP-4 position.

26. Ensure that 1800 to 2000 psi is in the oxygen cylinder of the kit.

27. Pull the manual oxygen release. Slowly open valve V-9 to indicate 90 LPM on gage PG-2. Oxygen pressure should be indicated as 45 to 80 psi on gage PG-1.

28. Observe emergency oxygen cylinder pressure gage and allow the system to decrease to 250 psi while maintaining 90 LPM and 45 to 80 psi pressure. When needle of this cylinder pressure gage is between the E and F of REFILL, pressure is approximately 250 psi.

29. Close valve V-9.

30. With zero flow indicated on gage PG-2, gage PG-1 should indicate 45 to 80 psi.

31. Reinstall the manual oxygen release (if separating type) and reset the reducer.

32. Bleed the oxygen pressure from the system by opening valves V-5 and V-2. All pressure is bled when gages PG-1 and PG-4 indicate zero pressure.

33. Disconnect the kit from the test stand.

34. Secure the test stand.

35. Thoroughly clean all areas wetted with leak test solution with clean water. Dry them with a lint-free cloth, filtered low-pressure compressed air, or by low pressure nitrogen.

36. Recharge the emergency oxygen cylinder to 1800 to 2000 psi.

37. Perform a release handle pull test on the fully packed kit. (Refer to NAVAIR 13-1-6.3 for instructions.)

Purging and Charging Emergency Oxygen Systems

To purge and charge the emergency oxygen cylinder proceed as follows:

Materials Required

Leak Detection Compound
Oxygen Purging Electric Heater
Nitrogen, Type I, Class I, Grade A
Aviator's Breathing Oxygen, Type I
Shut-off Valve
Pressure Regulator
Adapter, Filling

1. If the survival kit assembly has not been removed from the aircraft, remove the personnel parachute and survival kit in accordance with the applicable maintenance manual.

2. Remove the oxygen filler valve cap and connect a filling adapter to the filler valve (figure 15-9). If the emergency oxygen system is contaminated or the cylinder has remained empty for more than 2 hours, purging is required. If an emergency oxygen cylinder does not warrant the purging process, proceed to step 10 for the charging sequence. If it is necessary to release pressure in the oxygen bottle before purging/filling, pull the emergency oxygen lanyard. This releases the pressure through the pressure reducer. DO NOT release pressure through the filler valve or adapter. Releasing high-pressure oxygen through the restriction of the filler valve causes heat, and a fire or an explosion may result.

3. Deplete the emergency oxygen cylinder if necessary.

4. Connect a nitrogen source to the filling adapter and close the pressure reducer.

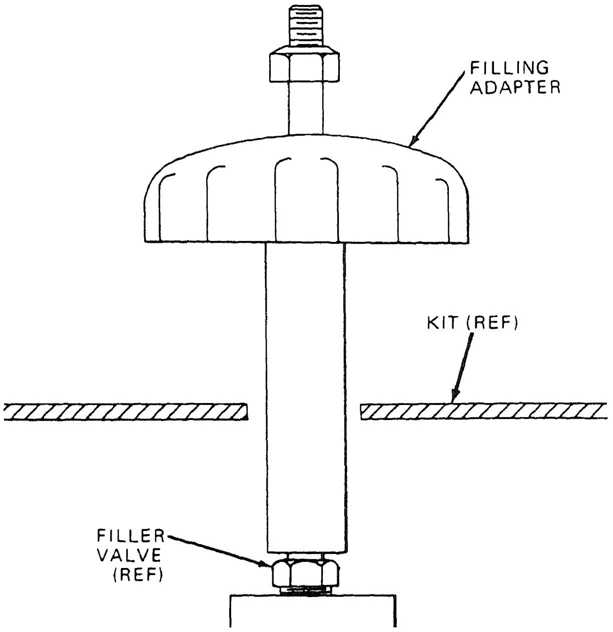

Figure 15-9.—Filling adapter.

Table 15-4.—Charging stages

Stage	PSI
1	500
2	1000
3	1500
4	1800
5	2000

5. Slowly pressurize to 100 psi with nitrogen temperature of 110° to 130°C (230° 266°F) using an electric heater.

6. Turn off the nitrogen source and deple the oxygen cylinder.

7. Repeat steps 5 and 6, twice.

8. With the pressure reducer open, turn o the nitrogen source and purge for 10 minutes a temperature of 110° to 130°C (230° to 266°F

9. Turn off the nitrogen source and discon nect it.

10. Connect the oxygen source to the fillin adapter with a suitable pressure regulator an shut-off valve. Reset the pressure reducer.

11. Slowly pressurize to 100 psi.

12. Deplete the cylinder to 50 psi.

13. Ensure that minimum slack exists in th actuating cables of the reducer/manifold, yet tha they are tight enough to ensure full engagemen of the toggle arm.

14. Charge the emergency oxygen system i stages in accordance with table 15-4 until th pressure gage indicates correct pressure fo existing ambient temperature as indicated on tabl 15-3. Carefully observe the scheduled fillin stages, since rapid application of oxygen pressur creates heat which may result in fire or explosion Allow no less than 3 minutes for each filling stag and 2-minute intervals for cooling between stages If the kit is to be stored or shipped, fill it to 20 psi (when needle on gage bisects E of REFILL)

15. Loosen the filling adapter until al pressure is bled from the high-pressure line Remove filling adapter. Visually ensure that th

filler valve does not turn as the filling adapter is removed. Serious injury could result.

16. Apply leak test compound around the filler valve, gage and reducer. Check for leaks, then wipe connections clean using a lint-free cloth.

17. Replace the oxygen filler valve cap on the filler valve.

18. If the personnel parachute and survival kit assembly were removed from the aircraft in step 1, reinstall them at this time.

APPENDIX I

GLOSSARY

ABRASION.—A fuzzy spot or area on cloth, usually caused by rubbing against an object.

ACC.—Abbreviation for Air Crew Systems Change.

ACCORDIAN-FOLDS.—Folding a canopy into S-shaped layers of predetermined size. Accordian folding produces a packaged parachute assembly in the desired finished shape.

ACID.—A fundamental chemical class distinguished by having reactive hydrogen radicals (pH below 7.0). Acids can be extremely corrosive to metal and damaging to fabric.

ACTUATOR, PARACHUTE, AUTOMATIC.—A barometrically controlled device which mechanically or by explosive force actuates the parachute ripcord assembly, causing the parachute container to open at a preset altitude.

ADAPTER, HARNESS.—A rectangular metal fitting with a fixed crossbar used primarily as an anchoring point.

ADAPTER, HARNESS FRICTION.—A rectangular metal fitting with a movable center bar (friction grip). Facilitates quick adjustment of a harness by the wearer.

AIRCREWMEMBER.—An aircraft crewmember. Passengers are not considered aircrewmembers.

ALKALINE.—A substance which is opposite to an acid, a base. Also, any substance which has the properties of an alkali (metallic hydroxide).

ANEROID.—A corrugated metal capsule used in parachute automatic actuators for sensing atmospheric pressure. The aneroid will initiate operation of an actuator at a preset altitude.

ANTI-SEIZE TAPE.—A tape of any of several thin plastic-film materials (such as tetrafluorethylene) characterized by a waxy, oily texture, and used to prevent binding between mating surfaces of threaded parts when applied to the male threaded portion.

APPROX.—Abbreviation for approximately.

ASSEMBLY.—A grouping of parts fitted together to form a complete unit.

ATMOSPHERIC PRESSURE.—Pressure at sea level, expressed as 14.696 pounds per square inch, absolute, or 29.92 inches mercury column (barometer). See also: PSIA and IN. HG.

AWL.—A pointed tool for piercing small holes in cloth, leather, wood and other soft materials.

BACKSTITCH.—A stitch made by inserting the needle a stitch length to the right and bringing it up an equal distance to the left. Also, sewing back over a row of stitches.

BAG, SHOT.—A bag filled with lead shot used to hold the canopy in place during packing.

BAG, DEPLOYMENT.—A canvas enclosure for the canopy and suspension lines. In use, the deployment bag controls release of suspension lines and canopy, insuring orderly opening.

BALL, CABLE RETAINING.—A steel ball which is swaged to the ripcord cable and secures the ripcord handle to the cable.

BAND, LATERAL.—Webbing inserted in canopy skirt and vent hems to reinforce edges and distribute load.

BAND, POCKET.—A piece of tape or line attached at the skirt hem and across the radial seam, which causes the gores to be pulled outward at inflation and thus improve opening characteristics of the canopy.

BAND, RETAINING.—A rubber band used to hold folded suspension lines in a container or faked lines together.

BARREL, AUTOMATIC ACTUATOR.—That part of an automatic actuator which houses the cartridge and piston or spring and piston.

BARTACK.—A concentrated series of zig-zag-like stitches used to reinforce points of stress. A bartack shall have 28 stitches per half-inch (per MIL-O-81900AS).

BEESWAX.—A wax generally with paraffin that is applied cold or melted to thread to prevent raveling or cloth unknotting and to make thread easier to sew.

BIAS CONSTRUCTION.—A type of canopy construction in which the canopy cloth is cut and sewn so that the centerline of each gore runs at a 45° angle to the warp and filling thread of the canopy cloth.

BINDING.—A piece of tape or fabric folded over and stitched to a raw edge of cloth to prevent raveling or fraying.

BODKIN.—A large-eyed, blunt needle instrument for inserting thread, tape, ribbon or line through a loop, hem or channel. Used to feed suspension lines through canopy radial seams or to stow suspension line bights in certain parachute container assemblies.

BOLT.—A package or roll of cloth of varying widths. Also, a measuring term for 40 yards of material.

BOTTOM, FALSE.—A piece of cloth sewn to the inside of a pack to retain the frame. It also serves as a base for attaching suspension line hesitator loops.

BRAID.—A narrow band of interlaced strands.

BREATHING.—The pulsating action of the parachute canopy when fully inflated.

BUNCHED STITCHING.—Stitches too close or more stitches per inch than required.

BURL.—A knot or lump in thread or cloth.

BURNS, FRICTION.—A hard spot on the suspension line caused by two lines rubbing together at high speeds, generally off-color and brittle.

C.—Abbreviation for Celsius.

CABLE, ARMING, AUTOMATIC PARACHUTE ACTUATOR.—A cable which, when attached to the ejection seat, lap belt or other designated point, arms the automatic parachute actuator at seat/man separation.

CABLE, POWER, AUTOMATIC ACTUATOR.—A cable, covered by a housing, which transmits the force from the automatic actuator to the ripcord cable.

CABLE, RIPCORD.—A flexible cable joining the locking pins and ripcord handle.

CANOPY.—The main supporting surface of a parachute which, when opened, reduces the rate of descent. It is usually made of nylon and includes a framework of cords, called suspension lines, from which the load is suspended.

CANOPY, CONICAL.—A canopy constructed in the shape of a cone. See also CANOPY.

CANOPY, EXTENDED SKIRT.—A canopy which has a flat circular center and an annular ring. See also CANOPY.

CANOPY, FLAT CIRCULAR.—A canopy which has the shape of a flat circle or disk when spread out. See also CANOPY.

CANOPY, GUIDE SURFACE.—A mushroom-shaped canopy in which alternate roof panels are extended to provide guide surfaces. See also CANOPY.

CANOPY, HEM-RIGGED.—A canopy, the suspension lines of which are attached to the skirt hem and do not pass over the drag-producing surface; for example, the 26-foot conical canopy. See also CANOPY.

CANOPY, RIBBON.—A canopy composed of concentric cloth ribbons, supported by radial ribbons and tapes. See also CANOPY.

CANOPY, RINGSAIL.—A canopy composed of concentric rings installed on a spherical surface. The slots that are contained in the gores are in the form of a crescent. See also CANOPY.

CANOPY, RING SLOT.—A canopy composed of concentric cloth strips with intervening air slots. The number of slots will vary with the diameter of the canopy. See also CANOPY.

CANVAS.—A heavy, closely-woven cloth of linen, cotton or synthetic fiber.

CASING (SLEEVE).—The outer woven cover of the suspension line.

CAUTION.—Indicates danger to equipment. The caution precedes the step or item to which it refers.

CDI.—Abbreviation for collateral duty inspector.

CCM.—Abbreviation for cubic centimeters per minute.

CHANNEL, CANOPY.—The space or opening formed by the overlapping of cloth in making of radial seams. The suspension lines pass through the channels and are retained in position. The channels aid in transmitting load from the lines to the cloth.

CHUTE.—Abbreviated slang form of parachute.

CLAMP, DUAL HOUSING.—A metal clamp located on the outside of the end flap of back- and seat-type parachutes. The clamp secures the ripcord cable and power cable to the container end flap.

CLEVIS.—A U-shaped metal fitting with a hole in each end to receive a pin or bolt.

CLIP.—A device which fastens, holds together or retains; for example, the clip which is tacked to a riser and holds the ripcord housing in place.

CLOTH, CANOPY.—The cloth used in parachute canopies. It is woven to withstand the impact of air pressure when the parachute opens. The canopy cloth is woven from nylon yarns, usually in a ripstop weave. See also CANOPY. (Ref. MIL-C-7020, Cloth, Nylon, Parachute.)

CLOTH, NYLON RIP-STOP.—A type of nylon cloth utilized in canopy manufacture. The weave pattern of the nylon cloth consists of reinforced ribs, in both the warp and the filling, forming a uniform pattern of squares. The cloth is designed to keep hole damage to a minimum when rips or tears develop in the canopy.

CLOVERLEAF HANDLE.—A ripcord handle that is used on chest- and integrated back-type parachutes. It is shaped in the form of a cloverleaf.

CO_2.—Abbreviation for carbon dioxide.

COLLAR, VENT.—A strip of nylon cloth. One edge is sewn to the vent hem of the canopy so that a collar or cylinder is formed above the top of the parachute. The other edge is hemmed to form a channel for the insertion of a molded rubber ring.

COMBUSTIBLE MATERIAL/SUBSTANCE.—Any material or substance capable of burning in the presence of oxygen. See also: EXPLOSIVE MIXTURE, FLAMMABLE MATERIAL.

COML.—Abbreviation for commercial. Refers to parts that are commercially available.

COMPONENT.—Item of equipment making up part of an assembly; for example, a ripcord housing is a component part of a ripcord assembly.

CONE, LOCKING.—A small, smooth, cone-shaped metal post sewn to the flaps of the container or inside the vane-type pilot parachute. The cone has a horizontally drilled hole a short distance from the top to admit a temporary locking pin or the ripcord pin. The pilot parachute locking cone contains two holes. The flange contains holes for securing purposes.

CONFIGURATION.—The makeup, size, shape, and relative location of parts of an item of equipment and its accessories. This includes the composition of the materials as well as marking details. The configuration of each equipment is specified by Government drawings, military specifications and modification instructions.

CONFLUENCE POINT.—A coming or running together of two or more lines.

CONTAINER.—An assembly that encloses and protects the canopy, suspension lines and risers until the parachute is opened. Sometimes called the pack assembly.

CONTAINER, HARDSHELL.—A container which has a rigid plastic or fiber body with cloth end and side flaps, designed to withstand high wind-blast conditions; for example, the NES-8B parachute container and certain MBEU parachute containers.

CONTRASTING COLOR.—A color which stands out from its background.

CONTROLLER DROGUE.—A small parachute which is used to extract the stabilizer drogue parachute.

CONVOLUTION.—Used in this manual as the protruding side or portion of a diaphragm.

CORE OVERLAP.—During suspension line manufacture, the insertion of an incoming core yarn which runs parallel to a running out yarn, results in two core yarn ends protruding through the casing a distance of about 2 to 6 inches. These ends are normally cut off during final phase of parachute suspension line manufacture.

CORDS, CLOSING.—Made of type I nylon cord approximately 18 inches in length. They are used as an aid in the closing of the parachute container.

CROSS BOX.—A sewing pattern.

CROWN.—A cloth panel used to cover the peak of a vane-type pilot parachute. Also, the portion of the main canopy surface near the peak.

CUSHION, SEAT.—A square, cloth-covered pad designed to provide comfort and equipped with a slot to provide passage for the harness leg straps.

CUTTER, PYROTECHNIC.—A device which is operated by an explosive charge and is used to cut line or webbing, etc.; for example, a static line cutter.

D-RING.—A metal fitting shaped in the form of a letter "D"; for example, a D-ring on a harness connects to a chest type parachute assembly by means of snap fittings. Also, a slang term for the ripcord handle.

DART.—A short, tapered seam.

DELAYED RELEASE JUMP.—A parachute jump in which the wearer purposely does not open the parachute immediately upon safely clearing the aircraft.

DIAMETER.—The greatest straight distance across a circle; specifically, the greatest distance across a flat canopy, from skirt to skirt, measured when the canopy is lying flat. Used to designate the size of a flat canopy.

DIAMETER, NOMINAL.—The diameter of a circle which has the same surface area as a given parachute canopy. This measurement is used to allow comparison of all shapes (conical, spherical, etc.) of parachute canopies.

DIAMETER, PROJECTED.—The greatest distance between opposite points on the skirt hem when the canopy is inflated. The projected diameter is approximately two-thirds the diameter of a flat canopy.

DIP.—A line or group of lines passing through a group of lines. Also, a group of suspension lines not in proper continuity. See also TWIST.

DISPOSITION.—Instructions on what is to be done with or to an item.

DOUBLE-W.—A sewing pattern.

DROP TEST.—The release of a parachute assembly with a dummy load from an airplane, tower or ejection seat for testing purposes.

DRY LOCKER.—A tower or compartment of suitable height that will satisfactorily air fully-suspended parachutes.

EJECTION SEAT.—An emergency escape seat for propelling an occupant out and away from the aircraft by means of an explosive charge or rocket motor.

EJECTOR BOARD.—A small, rectangular board with rounded edges and a grommet in one end, used on MBEU parachutes. It serves as a firm place for the pilot parachute to spring from during opening.

ELASTOMER.—Any of various elastic substances resembling rubber.

EMERGENCY KIT, PARACHUTE.—A Standard Soft Pack, High-Speed Soft Pack, Special Kit or Rigid Seat Survival Kit containing a raft and survival equipment needed by an aircrewman in case of emergency.

END OUT (MISSING END).—A warp yarn missing for a portion of, or the entire length of, cloth.

ENSURE.—Make certain that necessary measures are taken.

EXAMINE.—To inspect closely, and to test the condition of an item.

EXPLOSIVE MIXTURE.—Any mixture of a combustible material or substance and oxygen capable of violent burning (detonation) either spontaneously or with the external application of heat.

EYE.—A small, steel-wire loop; for example, the loops attached to the parachute container, into which a hook on a container spring opening band is fastened.

EYELET.—A small metal reinforcement for a hole in cloth, similar to a grommet, except thinner and smaller, and having no washer. The eyelet is used to reinforce lacing holes in small covers, etc.

F.—Abbreviation for Fahrenheit.

FAKE.—To fold a line, rope, cord or hawser in a back-and-forth fashion.

FASTENER, DIRECTIONAL.—A snap fastener which can be engaged or released only in one direction.

FASTENER, NON-DIRECTIONAL.—A snap fastener which can be engaged or released by applying pressure or pull from any angle.

FASTENER, SLIDE.—A type of fastener made of two lengths of tape with a series of metal or plastic scoops fastened to one side of each. A metal slide is provided which causes the scoops to mesh or lock in place as the fastener is closed or to separate as the fastener is opened. Colloq. ZIPPER.

FELT.—A cloth made from wool, fur, hair, synthetic fiber, or a mixture of these with cotton. It is made by matting the fibers together under pressure and heat.

FERRULE.—A cap or ring used to finish the end of a housing; for example, the finished ends of a ripcord housing.

FIBER.—A natural or synthetic filament (as of wool, cotton, rayon, etc.) capable of being spun into yarn.

FID.—A small, flat hand tool of metal or wood used during the packing process to straighten end flaps and to insert corner flaps into a finished pack.

FILLING.—Threads which are perpendicular to selvage edges, and extend across the width of cloth.

FITTING ASSEMBLY, DISCONNECT.—A releasing device used on the LW-3B parachute assembly which detaches both the static line and the ripcord assembly from the container side panel after either has effected opening of the container.

FITTING, CANOPY QUICK-RELEASE.—A device which connects the canopy and risers to the harness, permitting the aircrewman to disengage himself, on instant response, from the canopy.

FITTING, OVERRIDE DISCONNECT.—A directional fitting used on the NB-11, NES-12, and NES-16 parachute assemblies that connects the external pilot parachute and the pilot parachute.

FITTING, QUICK RELEASE.—A device used to connect and release on instant response. See also FITTING, CANOPY QUICK-RELEASE.

FITTING, SWAGE.—A connection, adapter or pin which is fastened to a cable by pressure. It is applied by means of a machine which compresses the fitting, causing it to tightly grip the cable or wire to which it is being attached.

FLAMMABLE MATERIAL.—Any material capable of being easily ignited and of burning with extreme rapidity.

FLAP, CORNER.—One of the small, rectangular cloth tabs which are part of the container side flaps and act as protection and reinforcement of the container corners when the parachute is packed.

FLAP, END.—A cloth extension on the short sides of the container base which folds over to enclose the canopy. One of the end flaps is usually designed as the ripcord end flap.

FLAP, SIDE.—A cloth extension on each of the long sides of the container base, which folds over and encloses the canopy. Each side flap is designated according to the fittings it carries; for example, "locking cone side flap" or "grom net side flap."

FLARING.—The process of opening or wi en- ing; for example, the method of splitting, ta ng and stitching the ends of webbing in orde to widen and prevent it from slipping throug an adapter.

FLOAT, MULTIPLE.—A place in cloth w ere a series of floats extend 3/16 inch or more

FLOAT, SINGLE.—A place in cloth whe e a filling or warp yarn extends unbound over the pick(s) with which it should be interlaced.

FOLDER.—A device used as an attachmen to a sewing machine to guide and fold cloth.

FRAME, CONTAINER.—The framework sed to stiffen and hold the container in shape.

FRAYED (SUSPENSION LINE).—A fuzzy on- dition in which short lengths or pieces of th ead or yarn protrude from surface of suspension ne.

FREEZING POINT.—Temperature at whi h a given liquid substance will solidify or freeze on removal of heat. Freezing point of water is 32 °F (0 °C).

FULL.—(In reference to oxygen cylinders) A full oxygen cylinder is a cylinder which is pressu ized to its rated pressure. With respect to a h gh-pressure oxygen cylinder, 1800 psig is consid red full.

FUNCTIONAL TEST.—A test which uts an item to use to determine if it ope ates properly.

GAPL.—Abbreviation for Group Assembly arts List. The GAPL, a section of the Illust ated Parts Breakdown, shows how major assem lies are disassembled into assemblies and c tail parts.

GORE.—That portion of the canopy lo ated between two adjacent radial seams and the vent and skirt hem. It consists of cloth sections ewn together.

GROMMET.—A metal eye and washer used to reinforce a hole in material; for example, grommets on container side flaps.

H_2O.—Abbreviation for water.

HANDLE, RIPCORD.—The handle secured to the ripcord cable and retained in a pocket located on the harness or container. Pulling of the handle begins the process of parachute opening. Often referred to as hand-pull or grip.

HARNESS.—An arrangement of webbing straps used to attach a parachute to the aircrewman. The harness serves as a sling to support the aircrewman during descent.

HARNESS, CHEST-TYPE.—A harness assembly used with attachable, chest-type parachutes.

HARNESS MAINSLING.—The main load-carrying member of the harness. Formed by two lengths of webbing, it is routed from the shoulder adapters or D-rings down across the seat, up the side ending at the opposite adapters or D-rings.

HEAT EXCHANGER.—Apparatus in which heat is exchanged from one fluid to another.

HEAVY BAR OR PLACE.—An area on cloth where pick count varies from normal count. See also PICK.

HEM.—A border or reinforced edge formed by folding cloth back and securing it, usually by sewing; for example, vent and skirt hem of a parachute canopy.

HG.—Abbreviation for mercury.

HOLE, CLOTH DAMAGE.—Three or more warp and/or filling threads broken at the same location.

HOOK, PACKING.—A special hook used to draw suspension lines into place in hesitator loops.

HOOK, TENSION.—Hooks used to retain the connector links during parts of the packing procedure.

HOUSING, EXTENSIBLE RIPCORD.—A ripcord and housing which can be extended approximately 4 inches to accommodate the addition of a raft kit to the seat-type parachute assembly.

HOUSING, RIPCORD.—A flexible steel tube encasing the ripcord cable, used to protect against accidental release or damage and to serve as a cable guide. Integrated ripcord assembly housings are constructed of vinyl-coated flexible tubing.

IN.—Abbreviation for inches.

IND.—Abbreviation for indicated.

IN. H_2O.—Abbreviation for inches of water column (27.68 in. H_2O equals 1.0 psi equals 2.036 in. Hg). See also: IN. HG.

IN. HG.—Abbreviation for inches of mercury column. (0.07349 in. Hg equals 1.0 in. H_2O) See also: IN. H_2O.

INNER CORE.—Five to nine internal yarns (number depending on type) for suspension lines which are covered by a woven sleeve or casing.

INSPECTION.—A close examination for damage, wear and dirt. Also, regularly scheduled examination of parachute assemblies. See also SERVICING PARACHUTES.

KEEPER.—Small strip of tape or loop used to retain an object; for example, riser and back pad keepers.

KIAS.—Knots Indicated Air Speed.

KICKPLATE.—A platform on the NES-8B parachute container which serves as a firm place for the pilot parachute to spring from during opening.

KIT BAG, FLYER'S.—A container made of canvas or nylon, reinforced with webbing usually with a slide fastener opening. It is used to carry the parachute and its accessories.

KNOT, BINDER.—The simplest method of joining two threads or lines. The two ends are placed side by side and a simple, overhand knot is then tied in both lines simultaneously. It will not slip when drawn tightly. Also called a thumb knot.

KNOT, BOWLINE.—A knot formed by making a small overhand loop a desired distance from the end of the line. The end of the line is then passed through the loop from the underside of the main part of the line and back through the small loop. When this knot is drawn tight, it will not slip but still can be easily untied.

KNOT, CLOVE-HITCH.—A knot formed by making one turn around a post, bringing the end across the line, continuing around the post a second time and passing the end under the second loop. Used to tie suspension lines to connector links.

KNOT, HALF-HITCH.—A knot formed by passing a cord or line around an object, then passing the free end around the main part of the cord and bringing the free end up through the loop thus formed. It is used to finish the tying of the suspension lines to the connector link and in forming safety ties.

KNOT, LARK'S HEAD.—A knot formed around an attachment ring or bar by passing the free ends of the line around the bar or through the ring and then through a loop or bight in the line. This knot is used to attach pilot parachute connector straps.

KNOT, OVERHAND.—A simple knot tied in the end of a line by forming a loop and passing the end over and down through the loop.

KNOT, SQUARE.—A knot formed by passing the end of the cord in the left hand over and under the end in the right hand and then reversing the process by passing the end in the right hand over and under the one in the left hand.

KNOT, SURGEON'S.—The surgeon's knot is similar to the square knot, except that the first overhand tie is wrapped twice around the cord or line.

LB.—Abbreviation for pounds.

LIFT WEBS.—The parts of parachute ha ness webbing or riser which extends from the con-nector links to the shoulder adapters, D-ri gs or quick-release fitting.

LINE, ANTI-SQUID.—A line attaching two suspension line connector links to canopy vent lines on some parachute assemblies. The anti-squid lines are shorter than suspension line and prevent the main canopy from squidding by bear-ing the load of the drogue parachute until the main canopy is fully opened. See also: SQUIDDING.

LINE, DROGUE LINK.—A line conn ting the withdrawal line to the drogue para hute on MBEU systems which do not emp oy a guillotine. The drogue link line contains a slide disconnect pin which will separate the lin and withdrawal line in case of manual para hute actuation.

LINE, SHORT ANTI-SQUID.—A M rtin-Baker patent improved anti-squid line, also called a pull down vent line. See L NE, ANTI-SQUID.

LINE, STATIC.—A line used to open a para-chute assembly without the necessity of p lling a ripcord manually. A static line is attach d to the ripcord and the aircraft or ejection seat. When the line becomes taut, it withdraws the ri cord locking pins or deployment bag. The para hute then opens.

LINE, SUSPENSION.—Nylon cords whic con-nect the canopy of the parachute to the h ness assembly.

LINE, TOGGLE.—One or more parachut lines that run from a slot or orifice in a ste able canopy to the harness, providing steera ility. When such lines are under tension d ring parachute opening or descent, they are cla ified as suspension lines.

LINE, VENT.—Nylon cord which cross s the vent opening of a canopy.

LINE, WITHDRAWAL.—A line connecting the stabilizer drogue on the ejection seat to the locking pins and canopy vent on the NES-8B and MBEU parachute assemblies. The line opens the container and withdraws the canopy during normal ejection operation.

LINK, CONNECTOR.—A small, releasable, rectangular metal fitting used to connect the lift webs and suspension lines.

LINK, CONNECTOR WITHDRAWAL LINE.—Nylon webbing with loops sewn in both ends. The withdrawal line connector link attaches the withdrawal line to the apex of the canopy and large loop in shortened anti-squid line.

LOCK, RIPCORD PIN.—The ripcord pin lock is used in conjunction with the ripcord pin pull test. The lock is designed in such a manner as to allow initial movement of the ripcord pins but does not permit them to totally disengage.

LOCKSTITCH.—A common sewing-machine stitch formed when the thread in the needle goes through the material and connects with the bobbin thread. The needle and bobbin thread should lock in the center of the material thickness. (Ref. Federal Standard 751, Type 301.)

LONG BAR.—A long metallic or wooden bar used in parachute packing and used as an aid in closing a parachute container.

LOOP.—A warp or filling thread pulled out to form a loop on a cloth surface.

LOOP, HESITATOR.—One of a series of webbing or tape loops which holds suspension lines in an orderly position in the container when the parachute is packed and which pays the lines out in sequence for orderly deployment of the canopy assembly.

LOOP, LOCKING.—A loop sewn to deployment bag or canopy to allow full extension of suspension lines before opening the canopy.

LOOP, RETAINING.—Webbing or tape loop used to hold folded lines or excess webbing in position.

LOOSE STITCHES.—Thread that does not lie smoothly on the surface of the cloth.

LOX.—Abbreviation for liquid oxygen.

LPM.—Abbreviation for liters per minute.

LUMP.—An internal imperfection of a suspension line that feels hard to the touch. It is usually caused by internal knots in core yarns or casings, or by slippage or displacement of one or more inner core yarns near an overlap.

MANUFACTURERS' CODES.—Identification codes for every manufacturer listed as a procurement source in accordance with cataloging handbooks H4-1 and H4-2, Federal Supply Codes for Manufacturers.

MARGIN.—The space from the outer row of stitching to edge of fold of the cloth.

MILDEW.—A damaging fungus or mold which forms on cloth and leather. It is caused by dampness and the absence of fresh air and sunlight.

MIS-PICK.—An extra or incorrectly positioned filling thread.

MISSING PICK.—A filling yarn (pick) wholly or partially missing.

MISSING STITCHES.—A space between stitches in same row in which there is no thread.

MM.—Abbreviation for millimeters.

NAMEPLATE.—A label attached to equipment, giving data as to type, model number, date of manufacture, date placed in service, etc. The stenciled gore on a canopy is called the nameplate gore.

NEEDLE DAMAGE.—Where needle penetration has damaged threads in the cloth.

NOTE.—An informative item. The note may precede or follow the step or item to which it refers.

OVEREDGE.—The stitching around the outer edge of cloth to prevent the edges from raveling or fraying.

OVERFOLD.—An excess of material causing edge of inner fold to double, wrinkle or pleat.

OVERLAP.—To extend over and cover a piece of cloth.

OVERLAP, CORE.—The overlapping of an incoming and outgoing suspension line inner core line.

PACK.—To put together compactly; to store neatly; for example, the act of packing a parachute consists of stowing suspension lines and canopy in the container assembly in such a way as to insure safe storage and proper opening of the parachute assembly.

PACK ASSEMBLY.—A rigged and packed parachute. See also: CONTAINER.

PACKING BOARD.—A tool used to tension suspension lines with the anti-squid lines attached to the connector links. Basically it consists of a board and two large spools.

PACKING TRAY.—The suspension line stowage assembly on the NES-8B parachute assembly. It is a cloth-covered board with hesitator tubes attached. After stowage of suspension lines the container is moved up around the tray. The tray is then secured by bolts which pass through the bottom of the container.

PAD, BACK.—A pad attached to the inside of the parachute harness to provide comfort.

PALM, SEWING.—A hand protector which is used when sewing.

PANEL, END SCOOP.—A scoop-shaped cloth pocket attached to the bottom of the LW-3B parachute assembly in place of an end flap.

PARACHUTE.—A device which offers resistance to the air, thereby decreasing the velocity of a descending body to permit landing at a suitable rate of descent.

PARACHUTE ASSEMBLY.—A complete parachute, including the canopy assembly, container assembly, harness assembly and riser/lift web assembly.

PARACHUTE, ATTACHED-TYPE.—A parachute assembly, such as T-10 or NES-15A, which has its container opening device attached to the aircraft or ejection seat by a static line.

PARACHUTE, BACK-TYPE.—A parachute which is worn on the back in order to allow the wearer freedom of movement; for example, the NB-6 parachute assembly.

PARACHUTE, CARGO.—A parachute used to air drop materials such as food, water, explosives, clothing, weapons and supplies.

PARACHUTE, CHEST-TYPE.—A parachute which is attached to D-rings on the chest-type harness. It may be detached to permit more freedom of movement.

PARACHUTE, DROGUE.—An auxiliary parachute used with any system that requires some method of deceleration or stabilization; for example, an ejection seat.

PARACHUTE, FREE-TYPE.—A parachute assembly, such as NS-3, which is opened by manual or automatic pulling of a ripcord. No static line is used with this type of parachute assembly.

PARACHUTE, PILOT.—A small, spring-operated, cloth-covered auxiliary parachute which is usually constructed on a steel wire frame and attached to the peak of the canopy. It accelerates the withdrawal of the canopy from the container. The pilot parachute is packed under tension and immediately opens when released from the container.

PARACHUTE, RESERVE.—A chest-type parachute attached to the harness of a training or test parachute in addition to the back-type. It has no pilot parachute. It is used in case the main parachute fails to open properly or sustains such damage as to cause an unsafe rate of descent.

PARACHUTE, SEAT-TYPE.—A free-type parachute suspended at the rear of the wearer between the hips and knees. It has an attached seat pad, together with the container, which serve as a cushion when entire assembly is in place in the seat.

PARACHUTE, TRAINING.—A combination of two parachute assemblies. A main, back-type parachute and reserve, chest-type parachute, with a training harness assembly designed to accommodate both parachutes. Its use is mandatory on all premeditated student training jumps.

PARACHUTE, TROOP.—A parachute used by a paratrooper for a premeditated jump over a designated area.

PARACHUTIST, NAVAL.—A person who has successfully completed a prescribed course in parachute jump training.

PARAFFIN.—Wax generally used with 50% beeswax as a hot dip to prevent the fraying of cut ends of webbing, cord and tape. See also BEESWAX.

PARARAFT.—An emergency, one-man life raft packed in a container, along with survival equipment. The pararaft is secured to the parachute pack or seat pan.

PARATROOPER.—A soldier trained and equipped to parachute into combat.

PEAK.—The top center of the parachute canopy, the point at which all vent lines cross. Also called apex or crown.

PERMEABILITY.—The measured amount, in cubic feet, of the flow of air through a square foot of cloth in 1 minute under a specified pressure.

pH VALUE.—An indication of the acidity or alkalinity of a solution. A reading of pH may be made by the use of test strips.

PICK.—A cloth filling thread, taken as a unit of fineness of cloth.

PILOT PARACHUTE FRAME.—Wire frame or spring used in a type of pilot parachute to initiate opening action of a parachute upon release from the container.

PIN, RIPCORD LOCKING.—A small steel pin attached to a ripcord and passed through a locking cone to hold a container in a closed position.

PIN, SLIDE DISCONNECT.—A directional fastener which connects the withdrawal line and drogue link line on MBEU parachutes not designed for use with a guillotine. One portion connects to the ejection seat and the other is a metal sleeve around the drogue link line. Depending on the direction of pull, the lines will either remain attached, or the slide disconnect pin will be withdrawn and the lines will separate.

PIN, TEMPORARY LOCKING.—A metal pin inserted through the eye of the locking cones to hold the side flaps in place until the ripcord pin is inserted.

PLATE, ANCHOR.—A narrow metal plate used on MBEU parachute assemblies. It is attached to the end of the ripcord housing and has holes which fit over the container locking cones. When the ripcord pins are inserted in the locking cones the anchor plate is held in place, thus holding the ripcord housing in position.

PLATE, LOCKING PIN.—A temporary locking pin attached to a thin, flat, rectangular metal plate. The pin-plate arrangement is used to temporarily lock the pilot parachute while the side flaps are being closed.

PLEAT.—A fold sewn in cloth.

POCKET, DATA CARD.—Small patch pocket sewn to specified parachute containers for record data card. (Record card used for Drogue Parachute Assemblies only.)

POCKET, ELASTIC STOWAGE.—A pocket, formed of elastic cloth, which encloses the external pilot parachute on the NB-11 parachute assembly.

POCKET, RIB.—A pocket made by sewing lengths of tape to a type of pilot parachute canopy to contain the four frame ribs.

POCKET, RIPCORD HANDLE.—A small pocket of cloth or elastic webbing sewn to the harness (or container assembly). It holds the ripcord handle in position.

POCKETS, DEFLATION.—Pockets sewn to the canopy at the skirt hem. After landing in water, they serve to anchor the canopy, causing the canopy to deflate. This prevents the canopy from dragging the parachutist through water.

POROSITY OF A FABRIC.—The measured amount, in cubic feet, of the flow of air through a square foot of fabric in 1 minute under specified pressure. Also known as PERMEABILITY.

PREMATURE OPENING.—Any accidental opening of a parachute, which occurs prior to intended deployment.

PRESSURE.—The force exerted by a liquid or gas per unit of area on the walls of a container. See also: PSIG, PSIA, and ATMOSPHERIC PRESSURE.

PRESSURE DROP.—Loss in pressure, as from one end of a distribution line to the other, due to friction and other factors.

PRESSURE EXPLOSION.—Explosion caused by rapid conversion of liquid oxygen to gaseous oxygen in a confined space due to evaporation and warming.

PROTRUDING YARN (Core Casing or Thread).—A condition in which either the inner core yarns extend through the casing, or where the yarns or threads of the casing extend beyond the surface of the casing itself.

PSI.—Abbreviation for pounds per square inch. See also: PSIA and PSIG.

PSIA.—Abbreviation for pounds per square inch, absolute. Absolute pressure is measured from absolute zero (100% vacuum), rather than from normal, or atmospheric pressure. It equals gage pressure plus 14,696 pounds per square inch. See also: PSI, PSIG, and ATMOSPHERIC PRESSURE.

PSIG.—Abbreviation for pounds per square inch, gage. Indicates pressure above ambient pressure, as indicated on a pressure gage vented to the atmosphere. See also: PSI and PSIA.

PULL UP CORDS.—Nylon cords of varying lengths used to pull up the sides and ends of the container flaps over the container cover and to pull the cones through the grommets. They are also used to pull the suspension lines into place in some types of containers.

PUSHPIN.—A straight pin used to temporarily secure material while sewing.

PYRO-BOX.—The container used to store pyrotechnic devices such as flares and cartridges while they are removed from the ammunition storage area.

PYROTECHNIC DEVICE.—Any device which either burns or explodes or uses burning or exploding to operate a system. Examples of pyrotechnic devices are static line cutters, ballistic spreading guns and automatic actuators.

QA.—Abbreviation for quality assurance.

QUALIFIED PERSONNEL.—Qualified personnel are defined as personnel who have satisfactorily completed a prescribed course at a Navy Training School, Fleet Readiness Aviation Maintenance Personnel Training Program (FRAMP), Inter Service/Factory Training, formal or informal In-Service Training (refer to OPNAVINST 4790.2 Series). In addition, a practical demonstration of the skills acquired in any of the foregoing training situations, to the satisfaction of the Work Center Supervisor/Division Officer is required before the designation "Qualified" can be assigned.

R.—Abbreviation for radius.

RATE OF DESCENT.—The speed which a parachute descends through the air. The rate varies according to atmospheric pressure, weight of load, movement of air (updraft and downdraft) and size, design and condition of canopy.

RAVEL (UNRAVEL).—To separate, untwist or unwind, leaving a frayed or ragged edge. Ravel is the preferred word to describe such a condition.

RECEIVER ASSEMBLY, AUTOMATIC ACTUATOR.—That part of the cartridge-actuated automatic actuator which houses the aneroid, sear and hammer.

REF.—Abbreviation for reference.

REFILL.—(In reference to oxygen cylinders) To refill is to recharge a cylinder, regardless of the residual pressure remaining within the cylinder.

REINFORCEMENT.—Any strengthening measure which enhances the basic integrity of a structure, joint or assembly; for example, the tape or webbing used to strengthen parts of a canopy, container, harness, etc., in a parachute assembly. See also: WEBBING, REINFORCEMENT.

RELEASE ASSEMBLY, RIPCORD HOUSING, MANUAL.—An assembly which releases the ripcord housing at the top end flap when the parachute is at full suspension line stretch.

REPAIRS, MAJOR.—Repairs requiring special equipment, personnel or materials normally not available at intermediate or local levels of maintenance.

REPAIRS, MINOR.—Repairs that can be effected at intermediate or local levels of maintenance.

RETAINING SLEEVE.—A series of stowage tunnels.

RFI.—Ready For Issue.

RIG.—To assemble and adjust; to equip. For example, the act of rigging a parachute assembly consists of assembling all component parts in preparation for packing.

RING, VENT.—A molded rubber ring in the vent collar. It stretches when the air rushes into the canopy as the parachute begins to inflate.

RIPCORD.—A locking device which secures the folded parachute within the container and which effects the release of the parachute. The ripcord consists basically of locking pins, a flexible cable and a handle. See also: ACTUATOR, AUTOMATIC PARACHUTE; BALL, CABLE RETAINING; CABLE, RIPCORD; CLAMP, RIPCORD HOUSING; HANDLE, RIPCORD; HOUSING, EXTENSIBLE RIPCORD; HOUSING, RIPCORD; PIN, RIPCORD LOCKING; POCKET, RIPCORD HANDLE.

RIPCORD PIN RETENTION TIE.—A thread of a predetermined value that is usually secured to a lead ripcord pin of a packed parachute. Its function is to retain a ripcord pin in its cone and prevent premature disengagement of the pin from the cone. USE ONLY AS AUTHORIZED.

RISER.—The webbing which connects an integrated torso suit or harness to the canopy assembly on parachutes. The riser is composed of two lift webs, and there are two risers on each parachute assembly.

RUNOFF.—Sewing not on a seam or cloth.

RUPTURE.—One or more yarns of suspension line casing being cut or severed, sometimes exposing the inner core. Occasionally, tears, cuts or other forms of damage to the canopy are defined as a rupture when caused by dynamic load conditions.

SADDLE.—That part of the main lift web of the harness which provides a seat or sling for the wearer.

SAFETY-TIE.—A low strength thread which serves to indicate that an assembly has not been damaged, tampered with or opened since the last regular inspection.

SCRAP.—To discard, with proper authorization, items, parts or materials which are obsolete or no longer usable.

SDLM—Standard Depot Level Maintenance. Provides for a comprehensive inspection of selected aircraft structures and materials, critical defect correction, preventive maintenance as required, modification and technical directive compliance to insure reliability and operational availability of the aircraft at minimum cost for the established operating service period, and to provide intermediate support during the total service life.

SDLM/CONVERSION.—Standard depot level rework concurrent with special rework, the accomplishment of which alters the basic characteristics of the aircraft to such an extent as to effect a change in any part of the model designation (i.e., F-4B to F-4D). NAVAIR approval required.

SDLM/CRASH DAMAGE.—In addition to accomplishing SDLM (Standard Depot Level Maintenance), repair and restoration to a serviceable condition that part of the aircraft that has sustained damage resulting from an accident or an incident.

SDLM/MODIFICATION.—Accomplishment of Standard Depot Level Rework concurrent with a modification that causes major work effort resulting from the installation of these technical directives. NAVAIR approval required.

SEAM.—A series of stitches joining two or more pieces of cloth. For Government work, the type of seam is indicated by a symbol which gives the class of seam, the number of stitching, and the number of rows of stitching. (Ref. Fed. Std. 751.)

SEAM, DIAGONAL.—A French-fell seam of the canopy which joins two sections of a gore. Diagonal seams meet the centerline of the gore at angles of 45° and 135°.

SEAM, ENGLISH-FELL.—A seam in which one piece of cloth is folded back upon itself and the other piece is a plain overlap.

SEAM, FOUR-NEEDLE FOUR-STITCH.—A method of stitching which can be performed in one operation by a four-needle sewing machine. It is used in sewing the vent hem, skirt hem and radial seams of a canopy.

SEAM, FRENCH-FELL.—A seam in which the cloth is folded back upon itself and stitched.

SEAM, OVERLAP.—A seam in which the two pieces of cloth are joined by overlapping enough to accommodate one or more rows of stitching.

SEAM, RADIAL.—A seam, joining two gores, which extends radially from the vent to the skirt hem.

SEAM, TWO-NEEDLE TWO-STITCH.—A seam in one operation by a two-needle sewing machine; for example, a diagonal seam.

SEAR.—To melt or seal with heat; for example, to sear the end of nylon webbing, one heats the end until the nylon melts and fuses. This prevents raveling. Also, the catch that holds the hammer of a firing mechanism cocked. The sear in an automatic actuator is attached to the aneroid in the receiver assembly.

SEAT PAN.—A sponge-rubber-covered metal seat which is contoured for comfort to the user. A seat pan is used with seat-type parachutes and back-type parachutes when a packaged Life Raft Assembly is used. A high-speed seat pan has sections for support under the pilot's thighs during ejection. This reduces leg strain caused by high acceleration loads.

SECTION.—Each major part of a gore. Sections are bordered by radial seams, diagonal seams or vent or skirt hems. In the 28-foot, flat canopy, four sections are used in each gore (previously known as panel).

SECURITY.—An item firmly, positively and safely attached in the authorized manner.

SELVAGE.—An edge of a woven fabric so formed as to prevent raveling, as compared to a cut edge, which will ravel.

SELVAGE, BROKEN.—Cut, broken or torn selvage edge.

SELVAGE, STRINGY OR LOOPY.—Irregular stringy or loopy selvage edge.

SEPARATOR, SUSPENSION LINE.—A tool used to aid in keeping suspension lines and canopy skirt in order while packing a parachute.

SERVICE LIFE.—The time period during which the item can be maintained in service without replacement.

SERVICING PARACHUTES.—Inspecting, cleaning, repairing and repacking parachutes at periodic (calendar) intervals. Periodic intervals for parachutes shall correspond either to the aircraft calendar inspection or to the phased maintenance inspection cycle program as directed by applicable MRC or Special Inspection Card Deck. In no case shall an interval exceed 217 days with exceptions to certain assemblies as noted in Chapter 3 of NAVAIR 13-1-6.2.

SERVING.—A method of wrapping or binding the ends of a cord or a line so it will not ravel. Sometimes referred to as "Whipping."

SEWING MACHINE.—A machine with a power-driven needle, used for sewing and stitching.

SHEARS, PINKING.—Shears with a saw-toothed inner edge on the blades for making zig-zag cut.

SHROUD LINE.—Slang for suspension line.

SKIPPED STITCHES.—Threads that are not interlocked.

SKIRT, CANOPY.—The lower edge of a canopy.

SLMIP.—Suspension Line Mandatory Inspection Point.

SLUB.—An abruptly thickened place in cloth caused by manufacturer's defect.

SM&R CODES.—Abbreviation for source, maintenance, and recoverability codes. Comprised of three parts; a two-position source code, a two-position maintenance code, and a one-position recoverability code.

SMASH.—Abrasion damage which causes broken warp and filling threads and weave separation.

SNAP, QUICK-CONNECTOR.—A large, hook-shaped, spring-loaded snap used to attach the chest-type parachute to the two D-rings on the harness.

SNAP, QUICK-EJECTOR.—A harness snap that attaches to the V-ring to secure two parts of the harness together. The ejector arm releases the V-ring when the finger-grip lever is pulled outward.

SOCKET, AUTOMATIC ACTUATOR.—The part of the automatic actuator which engages the ball on the power cable. This socket is attached to the piston by a rivet.

SPECIFIC GRAVITY.—Density of fluid compared to density of water.

SPEED LINK.—Slang for connector link.

SPLICE.—The joining of two strands or core ends by interweaving or mechanical joint.

SPREADER BAR.—A type of tension hook, used to hold connector links in position during parts of the packing procedure.

SPREADING GUN, BALLISTIC.—A device attached to suspension lines just below the skirt hem on the parachute assembly. Just before full suspension line stretch, the gun discharges and, by explosive force, spreads the skirt of the canopy.

SPRING, CONTAINER OPENING BANDS.—Stretchable bands composed of a series of springs installed in a cloth case with a hook at each end. They are installed under tension on the pack, to pull apart the end and side flaps after the ripcord is pulled. Also called pack opening band or bungee.

SQUIDDING.—A state of incomplete canopy inflation in which the canopy has a squid- or pear-like shape.

STAND, CONTAINER.—A rigid stand used to hold some parachute containers, such as the Martin-Baker horseshoe container, during part of the packing procedure.

STATIC LINE CUTTER.—A device used to cut the static line to free the parachutist and prevent entanglement.

STIFFENER, CONTAINER.—A piece of metal or fiberglass or phenolic fiber placed in the container to stiffen the flaps. These strips are also used for stiffening and shaping the bottoms of several back-type containers.

STITCH, BASEBALL.—A stitch used in repair and patching of fabrics. Refer to Repair/Fabrication, Chapter 4 of NAVAIR 13-1-6.2.

STITCH, BASTING.—A long, loose stitch made with single or double thread. Used to temporarily hold two or more pieces of material.

STITCH, BOX.—Rectangular stitch used to attach and reinforce.

STITCH, BUTTONHOLE.—A reinforced stitch, made on the edge of a slit or hole. Each individual stitch forms a half-hitch. The distance from the edge, and the spacing of the stitches is determined by the type of material used.

STITCH, OVERTHROW.—A stitch used to repair weakened seams, to reinforce slide fasteners and to join two pieces of material together.

STITCH, ZIG-ZAG.—A stitch made by sewing machine which stitches alternately on two or more parallel lines; for example, it is used to reinforce and anchor the suspension lines to the canopy. The number of stitches per inch is determined by counting the number of points on one side per linear inch.

STITCHES PER INCH.—The number of needle penetrations where threads are interlaced, per linear inch.

STRIP BACK.—Broken thread filament(s) wrapped around the remaining thread forming an enlarged area on cloth.

STRAP, CHEST.—The harness webbing which is secured across the chest with a snap and a V-ring to prevent the wearer from falling out of the harness.

STRAP, CROSS CONNECTOR.—A short length of webbing sewn across the lift web assembly or attached between suspension line connector links. It prevents streaming of a canopy in the event one riser was not properly attached to the harness.

STRAP, HORIZONTAL BACK.—An adjustable part of harness webbing extending across the small of the wearer's back.

STRAP, LAP RESTRAINT.—A strap attached to the integrated torso harness suit to retain the rigid seat survival kit to the wearer. Prior to ejection it serves as safety restraint for the aircrewman.

STRAP, LEG.—That part of the harness webbing which encircles the wearer's leg. The leg straps are adjustable.

STRAP, PILOT PARACHUTE CONNECTOR.—Tubular nylon webbing which joins the main parachute and the pilot parachute.

STRAP, SHOULDER.—The part of the harness webbing which crosses the wearer's back at the shoulder blades.

STRAP, SHOULDER RESTRAINT.—A short strap attached to the riser assembly on parachutes using the integrated torso harness suit. The strap connects to the seat and serves to hold the aircrewman in position in the seat in case of buffeting, severe g-loads or ejection.

STRAP, TENSION.—A strap which attaches to the peak of a canopy to keep the canopy and suspension lines taut during parts of the packing procedures.

STOWING.—The act of putting away in a neat, orderly way. Stowing of suspension lines involves inserting the lines into the hesitator loops or stowage channels in such a way as to insure proper paying out of lines when the parachute is opened. Stowing of the canopy involves folding and inserting the canopy into the container in such a way as to insure proper opening of the canopy when the parachute is used.

SUPPORT FIXTURE.—A rectangular piece of metal used to aid in closing the LW-3B personnel parachute assembly. The fixture is bolted to the container base and clamped to the packing table.

SURVEY.—A formal process by which a parachute or other accountable equipment is withdrawn from service or removed from records.

SWAGE.—To attach a device to a cable by means of pressure. A swaging machine compresses a fitting, causing it to grip tightly to the cable to which it is being attached.

T-HANDLE.—A handle in the shape of the letter "T".

TAB, ANCHOR.—A cloth loop attached to a metal plate and used on some MBEU parachute assemblies. It is placed over a locking cone and is used to secure the withdrawal line slide disconnect pin in position prior to operation.

TAB, END.—An oval metal fitting secured to each end flap of seat-type, Martin-Baker and chest-type parachute containers. The end tabs fit over the cones and secure the end flaps in a closed position until the locking pins are pulled.

TACK (HAND TACK).—To attach temporarily prior to final sewing. Also, to tie temporarily as an aid in positioning. Also, to permanently secure portions of a parachute together; for example, the attachment of a seat cushion to a parachute container assembly.

TACK, BUTTERFLY.—The type of tacking used in securing the riser assembly to the NC-3 container. See also TACK.

TAPE.—A narrow woven ribbon of cotton, linen, nylon or other material.

TAPE, FILAMENT.—An adhesive tape with fiber cords in the backing. The cords are usually fiberglass, nylon, linen or other high-strength material. This tape has high tensile strength along the lengthwise direction.

TAPE, HOOK.—Strip of nylon tape with small nylon hooks on one side. Hook tape is used with pile tape as a fastener.

TAPE, PILE.—A strip of nylon tape with small nylon loops on one side. Pile tape is used with hook tape as a fastener.

TAPE, SURGICAL.—A white linen or cotton tape with adhesive on one side. Commonly called adhesive tape.

TEAR STRENGTH.—The average force, expressed in pounds, required to continue a tear either across the filling or warp of cloth.

TEMPLATE.—A pattern or gauge commonly in the form of a thin plate of cardboard, wood or metal. It is used as a guide in the layout or cutting of flat work.

TENSILE STRENGTH.—The greatest stress cloth can withstand along its length without rupturing, expressed as a number of pounds per square inch (of cross section).

TERMINAL END FITTING.—The end of the automatic actuator arming cable which connects to the ejection seat, lap belt or other designated point. See also CABLE, ARMING, AUTOMATIC ACTUATOR.

THIN SPOT (Suspension Line).—A condition whereby the diameter of the suspension line as seen visually is less than other portions of the suspension line. This condition normally caused by broken inner cord yarn(s) or an improper overlap.

THREAD, SEPARATION.—A bunching of threads in cloth, leaving a hole or separation in the cloth. A thread separation can run either with the warp or filling of a cloth.

TIE, RIPCORD PIN RETAINING.—A low strength thread or cord used specifically to prevent ripcord pins from creeping and possibly causing inadvertent opening.

TIGHT STITCHES.—Thread under excess tension, causing one sewing thread to lie on the surface of the cloth or causing puckering of the cloth.

TOOL, PACK CLOSING.—An aid to closing the LW-3B parachute assembly container. It is used to align the grommets over locking cones.

TORSO HARNESS SUIT.—A combination of webbing and a torso suit which includes the parachute harness, lap belt, shoulder belt and life vest attachment fittings. See also HARNESS.

TORQUE.—A force or combination of forces that tend to produce a rotating or twisting motion. Torque is often expressed in inch-pounds or foot-pounds. A torque wrench is used to apply a measured torque.

TOTAL LIFE.—Total life is the period of time commencing with the date of manufacture that an item may be retained in a packaged, out-of-service condition and remain acceptable for service.

TUBE, GUIDE.—A narrow tube used to guide the vane-type pilot parachute grommet over its locking cone.

TWIST.—Rotation of the suspension line casing induced generally during final assembly of the canopy, suspension lines and connector links.

TWIST OF THREAD OR CORD.—The direction (right or left) in which the strands of thread or cord are wound around one another. If the thread unwinds when turning it to the left, it is right twist; if it tightens, it is left twist. Right twist is also known as Z-twist. Left twist is also known as S-twist.

TYP.—Abbreviation for typical.

UNDERFOLD.—Insufficient cloth folded inside a seam. The raw edges of cloth will show when underfold is excessive.

UNEVEN STITCHING.—Stitching wavy, or number or stitches varying.

UNTACK.—To remove a tacking. See also TACKING.

V-RING.—A metal fitting shaped in the form of a closed letter "V". For example, V-rings, used with quick-ejector snap fittings, secure a harness assembly on a wearer.

V-TAB.—Webbing reinforcement at the point where the suspension line enters the canopy.

VENT.—The circular opening at the peak or top of the canopy. As the parachute opens and descends, some of the air in the canopy escapes through this vent, thus reducing the strain on the canopy and steadying descent. It is about 18 inches in diameter for personnel parachutes.

WARNING.—Indicates danger to personnel. The warning precedes the step or item to which it refers.

WARNING FLAG.—A tag attached to an assembly, indicating that the assembly is not operational. Often the flag is attached to safety-pins on pyrotechnic devices to indicate necessity of removal before operation. Also, it is used to flag defective or incomplete equipment to preclude use.

WARP.—The threads that run parallel to the selvage edge of cloth; those that are crossed by the filling threads.

WEAVE.—To manufacture a web or cloth on a loom by interlacing the warp and filling yarns. Also the particular pattern employed in weaving cloth. The cloth for parachute use is one up and one down (plain weave), two up and one down (twill weave) or rip-stop.

WEAVE SEPARATION.—Looseness of weave caused by strain or poor weaving.

WEB (WEBBING).—A strong, narrow, closely-woven tape of synthetic, cotton or linen fiber designed for bearing weight. For example, it is used in the manufacture of the parachute harness.

WEBBING, ELASTIC.—A webbing having elastic warp threads to give it greater elasticity than regular webbing. It is used in the fabrication of elastic ripcord pockets.

WEBBING, REINFORCEMENT.—Short lengths of webbing sewn to the skirt hem at the junction points of the suspension lines and the canopy.

WEBBING, TUBULAR.—Strong synthetic or natural fiber webbing woven in the form of a tube.

WET LOCKER.—A tower or compartment maintained for hanging parachutes which are damp or have been immersed in water.

WHIPSTITCH.—A stitch used to join two pieces of webbing and to reinforce weak seams.

WHISKER.—A thread filament protruding from cloth.

YOKE AND PLATE ASSEMBLY.—The removable end of a connector link.

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AIRCREW SURVIVAL EQUIPMENTMAN 3&2, VOLUME 2

NAVEDTRA 10329

Prepared by the Naval Education and Training Program Development Center, Pensacola, Florida

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Your NRCC contains a set of assignments and perforated answer sheets. The Rate Training Manual, Aircrew Survival Equipmentman 3&2 Volume 2, NAVEDTRA 10329 , is your textbook for the NRCC. If an errata sheet comes with the NRCC, make all indicated changes or corrections. Do not change or correct the textbook or assignments in any other way.

HOW TO COMPLETE THIS COURSE SUCCESSFULLY

Study the textbook pages given at the beginning of each assignment before trying to answer the items. Pay attention to tables and illustrations as they contain a lot of information. Making your own drawings can help you understand the subject matter. Also, read the learning objectives that precede the sets of items. The learning objectives and items are based on the subject matter or study material in the textbook. The objectives tell you what you should be able to do by studying assigned textual material and answering the items.

At this point you should be ready to answer the items in the assignment. Read each item carefully. Select the BEST ANSWER for each item, consulting your textbook when necessary. Be sure to select the BEST ANSWER from the subject matter in the textbook. You may discuss difficult points in the course with others. However, the answer you select must be your own. Remove a perforated answer sheet from the back of this text, write in the proper assignment number, and enter your answer for each item.

Your NRCC will be administered by your command or, in the case of small commands, by the Naval Education and Training Program Development Center. No matter who administers your course you can complete it successfully by earning a 3.2 for each assignment. The unit breakdown of the course, if any, is shown later under Naval Reserve Retirement Credit.

WHEN YOUR COURSE IS ADMINISTERED BY LOCAL COMMAND

As soon as you have finished an assignment, submit the completed answer sheet to the officer designated to grade it. The graded answer sheet will not be returned to you.

If you are completing this NRCC to become eligible to take the fleetwide advancement examination, follow a schedule that will enable you to complete all assignments in time. Your schedule should call for the completion of at least one assignment per month.

Although you complete the course successfully, the Naval Education and Training Program Development Center will not issue you a letter of satisfactory completion. Your command will make an entry in your service record, giving you credit for your work.

WHEN YOUR COURSE IS ADMINISTERED BY THE NAVAL EDUCATION AND TRAINING PROGRAM DEVELOPMENT CENTER

After finishing an assignment, go on to the next. Retain each completed answer sheet until you finish all the assignments in a unit (or in the course if it is not divided into units). Using the envelopes provided, mail your completed answer sheets to the Naval Education and Training Program Development Center where they will be graded and the score recorded. Make sure all blanks at the top of each answer sheet are filled in. Unless you furnish all the information required, it will be impossible to give you credit for your work. The graded answer sheets will not be returned.

The Naval Education and Training Program Development Center will issue a letter of satisfactory completion to certify successful completion of the course (or a creditable unit of the course). To receive a course-completion letter, follow the directions given on the course-completion form in the back of this NRCC.

You may keep the textbook and assignments for this course. Return them only in the event you disenroll from the course or otherwise fail to complete the course. Directions for returning the textbook and assignments are given on the book-return form in the back of this NRCC.

PREPARING FOR YOUR ADVANCEMENT EXAMINATION

Your examination for advancement is based on the Occupational Standards for your rating as found in the MANUAL OF NAVY ENLISTED MANPOWER AND PERSONNEL CLASSIFICATIONS AND OCCUPATIONAL STANDARDS (NAVPERS 18068). These Occupational Standards define the minimum tasks required of your rating. The sources of questions in your advancement examination are listed in the BIBLIOGRAPHY FOR ADVANCEMENT STUDY (NAVEDTRA 10052). For your convenience, the Occupational Standards and the sources of questions for your rating are combined in a single pamphlet for the series of examinations for each year. These OCCUPATIONAL STANDARDS AND BIBLIOGRAPHY SHEETS (called Bib Sheets), are available from your ESO. Since your textbook and NRCC are among the sources listed in the bibliography, be sure to study both as you take the course. The qualifications for your rating may have changed since your course and textbook were printed, so refer to the latest edition of the Bib Sheets.

NAVAL RESERVE RETIREMENT CREDIT

This course is evaluated at 12 Naval Reserve retirement points which will be credited upon satisfactory completion of Assignments 1 through 8.

COURSE OBJECTIVE

By completing this course you will demonstrate your understanding of the following material: Organization and administration of work centers; familiarization of personnel parachutes and inspecting parachutes; testing and repairing automatic opening devices; performing inspections and repacking of the NB-8, NES-12 and NES-14A personnel parachutes; testing inflatable equipment; conducting inspections on oxygen related components, miniature oxygen regulators, aircraft mounted regulators, LOX converters and inspection of oxygen test stands; testing and inspecting rigid seat survival kits.

While working on this correspondence course, you may refer freely to the text. You may seek advice and instruction from others on problems arising in the course, but the solutions submitted must be the result of your own work and decisions. You are prohibited from referring to or copying the solutions of others, or giving completed solutions to anyone else taking the same course.

Naval courses may include a variety of questions -- multiple-choice, true-false, matching, etc. The questions are not grouped by type; regardless of type, they are presented in the same general sequence as the textbook material upon which they are based. This presentation is designed to preserve continuity of thought, permitting step-by-step development of ideas. Some courses use many types of questions, others only a few. The student can readily identify the type of each question (and the action required) through inspection of the samples given below.

MULTIPLE-CHOICE QUESTIONS

Each question contains several alternatives, one of which provides the best answer to the question. Select the best alternative, and blacken the appropriate box on the answer sheet.

SAMPLE

s-1. The first person to be appointed Secretary of Defense under the National Security Act of 1947 was
1. George Marshall
2. James Forrestal
3. Chester Nimitz
4. William Halsey

Indicate in this way on the answer sheet:

	1 T	2 F	3	4	
s-1	☐	■	☐	☐	___

TRUE-FALSE QUESTIONS

Mark each statement true or false as indicated below. If any part of the statement is false the statement is to be considered false. Make the decision, and blacken the appropriate box on the answer sheet.

SAMPLE

s-2. Any naval officer is authorized to correspond officially with any systems command of the Department of the Navy without his commanding officer's endorsement.

Indicate in this way on the answer sheet:

	1 T	2 F	3	4	
s-2	☐	■	☐	☐	___

MATCHING QUESTIONS

Each set of questions consists of two columns, each listing words, phrases or sentences. The task is to select the item in column B which is the best match for the item in column A that is being considered. Items in column B may be used once, more than once, or not at all. Specific instructions are given with each set of questions. Select the numbers identifying the answers and blacken the appropriate boxes on the answer sheet.

SAMPLE

In questions s-3 through s-6, match the name of the shipboard officer in column A by selecting from column B the name of the department in which the officer functions.

A	B
s-3. Damage Control Assistant	1. Operations Department
s-4. CIC Officer	2. Engineering Department
s-5. Disbursing Officer	3. Supply Department
s-6. Communications Officer	

Indicate in this way on the answer sheet:

	1 T	2 F	3	4	
s-3	☐	■	☐	☐	___
s-4	■	☐	☐	☐	___
s-5	☐	☐	■	☐	___
s-6	■	☐	☐	☐	___

Assignment 1

Administration

Text: Pages 1-1 through 1-17

In this course you will demonstrate that learning has taken place by correctly answering training items. The mere physical act of indicating a choice on an answer sheet is not in itself important; it is the mental achievement, in whatever form it may take, prior to the physical act that is important and toward which course learning objectives are directed. The selection of the correct choice for a course training item indicates that you have fulfilled, at least in part, the stated objective(s).

The accomplishment of certain objectives, for example, a physical act such as drafting a memo, cannot readily be determined by means of objective type course items; however, you can demonstrate by means of answers to training items that you have acquired the requisite knowledge to perform the physical act. The accomplishment of certain other learning objectives, for example, the mental acts of comparing, recognizing, evaluating, choosing, selecting, etc., may be readily demonstrated in a course by indicating the correct answers to training items.

The comprehensive objective for this course has already been given. It states the purpose of the course in terms of what you will be able to do as you complete the course.

The detailed objectives in each assignment state what you should accomplish as you progress through the course. They may appear singly or in clusters of closely related objectives, as appropriate; they are followed by items which will enable you to indicate your accomplishment.

All objectives in this course are learning objectives and items are teaching items. They point out important things, they assist in learning, and they should enable you to do a better job for the Navy.

This self-study course is only one part of the total Navy training program; by its very nature it can take you only part of the way to a training goal. Practical experience, schools, selected reading, and the desire to accomplish are also necessary to round out a fully meaningful training program.

Learning Objective: Identify the purposes of records and reports and the contents and use of different parts of the Naval Aeronautic Publication Index. Recognize the types, numerical classifications, and originators of publications, including procurement methods and updating procedures.

1-1. Which of the following manuals is classified as a general manual?
1. 00-500
2. 01-500
3. 03-500
4. 04-500

1-2. To find information that deals with an accessory item, which of the following manuals should you use?
1. NAVAIR 00
2. NAVAIR 03
3. NAVAIR 17
4. NAVAIR 19

1-3. If you were told to locate a Naval Aeronautic Publication Index, in which of the following manuals would you find it?
1. NAVAIR 13-5-501
2. NAVAIR 35-QH-2
3. NAVAIR 00-500A
4. NAVAIR 13-1-6.3

1-4. The Naval Aeronautic Publication is divided into how many parts?
1. One
2. Two
3. Three
4. Four

1-5. To find a listing of all the directives that apply to an aircraft, which manual would you use?
1. NAVAIR 00-500A
2. NAVAIR 00-500B
3. NAVAIR 00-500C
4. NAVAIR 00-500D

1-6. Which of the following manuals would you use to locate the Microfilm Cartridge Cross-Reference?
1. NAVAIR 00-500A
2. NAVAIR 00-500C
3. NAVAIR 00-500M
4. NAVAIR 00-31/MC

1-7. Listings of aeronautic publications originated by NAVAIRSYSCOM and distributed by Naval Air Technical Services Facility are found in
1. NAVSUP 2002
2. NAVSUP 4004
3. NAVAIR 13-5-5.01
4. NAVAIR 00-500-A

1-8. Accessories manuals (03 Series) are listed in which of the following manuals or publications?
1. NAVSUP 2002
2. NAVAIR 00-500A
3. NAVAIR 00-500B
4. All of the above

Learning Objective: Identify the 13 series manuals and their contents.

1-9. In what series of manuals do you find accessories listed?
1. 00
2. 01
3. 02
4. 03

1-10. A listing of manuals covering a particular part number of an accessory to an aircraft can be located in which of the following publications?
1. NAVAIR 00-500-A
2. NAVAIR 00-500-B
3. NAVAIR 00-500-C
4. NAVAIR 00-500-D

1-11. Technical information pertaining to the PR rating is covered in which of the following series of manuals?
1. 01
2. 03
3. 05
4. 13

1-12. Aviation Crew System manuals are released by what authority?
1. Naval Air Systems Command
2. Chief of Naval Operations
3. Bureau of Naval Personel

1-13. The NAVAIR 13-1-6 (Series) manuals are distributed in how many separate volumes?
1. Eight
2. Seven
3. Six
4. Five

1-14. The configurations of equipment found in the NAVAIR 13-1-6 (Series) manual cannot be altered without written approval from which, if any, of the following personnel?
1. The pilot that has the equipment
2. The PR in charge of the parachute loft
3. The maintenance officer
4. None of the above

1-15. The NAVAIR 13-1-6.2 (Series) takes precedence over all other documents EXCEPT which of the following publications?
1. Aircrew System Changes
2. Aircrew System Bulletins
3. Interim Aircrew System Changes
4. All of the above

1-16. Where do you file an Aircrew System Change that supersedes a NAVAIR 13-1-6 (Series) manual?
1. In front of the manual
2. Behind the index
3. Under the subject matter
4. In a folder marked Aircrew System Changes

1-17. A Shop Process Card consists of which of the following pieces of information?
1. Clearance
2. Tolerances
3. Material required
4. All of the above

1-18. Collateral duty cards denote which of the following?
1. Tolerances only
2. Finished products only
3. Tolerances and finished products
4. All mandatory inspection points

1-19. While you are performing a maintenance function using SPCs, you come to a NOTE. What does this NOTE indicate?
1. Danger to equipment
2. Danger to personnel
3. It is an information item only

1-20. When using technical manuals you come to a CAUTION. What does CAUTION indicate?
1. Danger to equipment
2. Danger to personnel
3. Danger to equipment and personnel

1-21. To what or whom does a WARNING indicate danger?
1. Equipment only
2. Personnel only
3. Equipment and personnel

1-22. If your shop chief asked you to look up some safety precautions, which of the following manuals should you use?
1. NAVAIR 4790.2B
2. NAVAIR 35QH2
3. NAVAIR P-5100
4. NAVMAT P-5100

1-23. OPNAV Instruction 5100.19 gives you information on
1. uniform regulations
2. safety precautions ashore
3. safety Precautions aboard ship
4. maintenance aboard ship

Learning Objective: Locate the information necessary to order flight gear.

1-24. If you were to check the allowance authorized for flight gear in your squadron, you would refer to the
1. NA 00-35-QH-2
2. NA 00-35-QH-1
3. NA 00-35-QK-1
4. NA 00-35-QFG-1

1-25. When equipment contained in the NA 00-35-QH-2 is ordered by the operating squadrons, it becomes the property of
1. the aircrewman receiving the gear
2. intermediate maintenance
3. organizational maintenance
4. Air Systems Command

1-26. The NA 00-35-QH-2 has an alphabetical index and how many parts?
1. One
2. Two
3. Three
4. Four

1-27. Which part of the NA 00-35-QH-2 would you find flotation equipment?
1. Part 1
2. Part 2
3. Part 3
4. Part 4

Locate, order, and update manuals and letter-type publications.

1-28. To find a complete listing of letter-type publications and forms, you should refer to which of the following manuals?
1. NAVAIR 2002
2. NAVSUP 2002
3. OPNAV 500A
4. OPNAV 500B

1-29. When a change is required and it will take too long to issue a formal technical directive, NAVAIR will issue a/an
1. interim change
2. RAMEC
3. BACSEB
4. CAMI

1-30. After an interim change (EXCEPT a RAMEC) is issued, a formal directive superseding the interim shall be issued within how many days?
1. 90
2. 180
3. 220
4. 225

Question 1-31 is to be judged True or False.

1-31. Amendments are documents comprised of information which classifies, corrects, adds to, deletes, or makes minor changes to technical directives.

1-32. Which, if any, of the following is a completely new edition of an existing change or bulletin?
1. Amendment
2. Revision
3. Recision
4. None of the above

1-33. Which of the following instructions is a rewritten instruction?
1. NAVAIR 2515/1
2. NAVAIR 2515
3. NAVAIR 2515.2
4. NAVAIR 2515.2A

1-34. Which of the following technical directives or instructions is of a 1-time nature?
1. Aircrew System Change 149
2. Aircrew System Change 249
3. OPNAVINST 4790.2B
4. Aircrew System Bulletin #228

Learning Objective: Identify and correctly fill out the forms used in Naval Aviation Maintenance.

1-35. Which of the following OPNAV forms is a five-part VIDS/MAF?

1. OPNAV 4790/59
2. OPNAV 4790/60
3. OPNAV 4790/42
4. OPNAV 4790/43

1-36. In order to ensure historical records are updated, you should use which of the following blocks on a VIDS/MAF?

1. Entries Required Signature
2. Reference
3. Failed/Required Material
4. Technical Directive

1-37. When performing a toolbox inventory, where should you enter the inventory?

1. OPNAV Form 47980/2A
2. Reference/Local Use Block (VIDS/MAF)
3. Entries Required Signature Block (VIDS/MAF)

1-38. If three men were working on a job and it took them a total of 2.5 hours to complete the job, what would be the elapsed maintenance time?

1. 2.5 hours
2. 5 hours
3. 7 hours
4. 7.5 hours

1-39. Where can you find a listing of organization codes?

1. NAVAIR 4790.2B
2. OPNAVINST 4790.2B
3. NAVAIR 13-5-501
4. NAVSUP 2002

1-40. If you were to use a maintenance level code of 1, you would be referring to which of the following maintenance levels?

1. Intermediate
2. Organizational
3. Depot

1-41. When you use the CF REQ/RFI block at the organizational level on a VIDS/MAF, what does an X in the block indicate?

1. A check flight is required
2. The equipment is RFI
3. No action required

1-42. If an organizational level activity places an X in the REQ/BCM block on a VIDS/MAF it would indicate that the item

1. requires a Q.A.R. Inspection
2. requires a C.D.I. Inspection
3. is beyond the capability of maintenance

1-43. Which of the following forms is a support action form?

1. OPNAV 4790/60
2. OPNAV 4790/59
3. OPNAV 4790/42
4. NAVAIR 4790/42

1-44. To document man-hours for refueling an aircraft, you would use which of the following forms?

1. OPNAV 4790/42
2. OPNAV 4790/60
3. OPNAV 4790/59
4. OPNAV 4790/55

1-45. When you use a SAF, the tool inventory is valid when the form is signed by the

1. C.D.I.
2. supervisor
3. QAR
4. worker

Assignment 2

Personnel Parachute Familiarization

Text: Pages 2-1 through 2-13

Learning Objective: Identify basic criteria and associated functions, operating characteristics, and methods of parachute assembly.

2-1. What are the main components of a parachute assembly?
1. Suspension lines, canopy, and harness
2. Canopy, suspension lines, harness, and container
3. Pilot chute, canopy, suspension lines, container and harness

2-2. What is the weight of the material used to manufacture parachutes?
1. 1.1 oz
2. 1.5 oz
3. 2.0 oz
4. 4.5 oz

2-3. What is the tensile strength of ripstop nylon?
1. 42 lb per sq in.
2. 50 lb per sq in.
3. 75 lb per sq in.
4. 100 lb per sq in.

2-4. What is the tear strength of ripstop nylon?
1. 1 lb
2. 2 lb
3. 5 lb
4. 4 lb

2-5. How many sizes of canopies are used in Navy personnel parachutes?
1. Five
2. Six
3. Three
4. Four

● Question 2-6 is to be judged True or False.

2-6. A 28-foot canopy has 28 sides and a diameter of 28 feet ± 1 inch.

2-7. The sewing on a parachute varies in the amount of stitches-per-inch. On a 28-foot canopy the stitches shall be between
1. 5 to 8 per in.
2. 7 to 12 per in.
3. 8 to 10 per in.
4. 8 to 15 per in.

2-8. What is the air permeability of 1.1 oz. ripstop nylon?
1. 80 to 100 cubic feet per min
2. 70 to 100 cubic feet per min
3. 60 to 80 cubic feet per min
4. 60 to 90 cubic feet per min

● Questions 2-9 and 2-10 are to be judged True or False.

2-9. The material lying between two suspension lines is called a gore.

2-10. Suspension lines on a 28-foot canopy run continuously from connector link to connector link.

2-11. How many sections are there in each gore?
1. Six
2. Two
3. Eight
4. Four

2-12. When cutting material for the construction of a parachute canopy, you cut the material for bias construction. This is done by cutting the material at
1. a 45° angle
2. a 90° angle
3. the salvage edge

2-13. Where can the manufacturer's code be found on a 28-foot canopy?
1. Section B of gore 28
2. Section C of gore 28
3. Section A of gore 28
4. Section D of gore 28

2-14. What is the tensile strength of 1-inch tubular nylon webbing?
1. 1000 lb
2. 1800 lb
3. 2000 lb
4. 4000 lb

2-15. During high speed openings, what part of a parachute prevents dangerous ruptures to the canopy?
1. Vent
2. Vent hem
3. Pilot chute
4. Blowout patch

2-16. All machine stitching on a parachute (except zigzag) should conform to (a) what type and (b) what federal standard?
1. (a) 301 (b) 750
2. (a) 301 (b) 751
3. (a) 302 (b) 750
4. (a) 302 (b) 751

2-17. What size nylon thread should be used for sewing diagonal seams?
1. E nylon only
2. B nylon only
3. E or B nylon
4. F nylon

2-18. When stenciling a canopy, what type of marking fluid should you use?
1. MIL-I-6903A AM 1
2. MIL-F-2300
3. MIL-I-4790A
4. MIL-F-1316.2

2-19. What is the service life of a 28-gore personnel parachute canopy which was placed in service 60 days following manufacturing?
1. 7 years and 2 months
2. 8 years and 2 months
3. 10 years and 2 months
4. 12 years and 2 months

● Question 2-20 is to be judged True or False.

2-20. Suspension lines are placed under a 20-pound tension, marked and cut as a group.

2-21. On a 28-foot canopy, the suspension lines run continuously from connector link to connector link. What is the overall length of a suspension line?
1. 15 ft 4 in.
2. 28 ft 6 in.
3. 75 ft 4 in.
4. 96 ft 3 in.

2-22. What is the tensile strength of a suspension line?
1. 200 lb
2. 300 lb
3. 500 lb
4. 550 lb

2-23. How are suspension lines attached to the connector links?
1. With a clove-hitch, a half-hitch, and 2 + 1/2 or - 1/4 inches of zig-zag stitching
2. With two clove-hitches
3. With two half-hitches
4. Sewn together with No. 3 cord

● Questions 2-24 and 2-25 are to be judged True or False.

2-24. Parachute containers house the pilot chute, main canopy, suspension lines, and harness.

2-25. Parachute harnesses are made of 1 3/4 inches wide nylon webbing; the tensile strength of which ranges from 6000 to 8700 pounds.

2-26. If a container was manufactured in July 1970, when must it be removed from service regardless of the date placed into service?
1. July 1977
2. July 1980
3. July 1982
4. July 1985

2-27. After the parachute has been packed inside, what, if anything, holds the container closed?
1. Ripcord pins and locking cones
2. Pack opening bands
3. Pack closing bands
4. Nothing

2-28. What type of harness, if any, is used with a chest type parachute?
1. Quick-fit harness
2. Torso harness
3. Universal harness
4. None

2-29. Quick-fit harnesses are designed to be worn with which of the following types of parachutes?
1. Seat
2. Chest
3. Back
4. All of the above

2-30. How many types of parachute harnesses are used in the Navy?
1. One
2. Two
3. Three
4. Four

2-31. What is the diameter of a ripcord cable?
1. 1/4 in.
2. 7/16 in.
3. 3/32 in.
4. 1/8 in.

2-32. Ripcord pins are swagged in place and tested at
1. 50 lb
2. 100 lb
3. 200 lb
4. 300 lb

2-33. If a harness was manufactured in September 1980 and placed in service in October of the same year, when will the harness have to be removed from service?
1. September 1987
2. October 1987
3. September 1992
4. October 1992

2-34. What is the tensile strength of a "D" ring?
1. 1000 lb
2. 2000 lb
3. 3000 lb
4. 5000 lb

2-35. What is the tensile strength of a "V" ring?
1. 1000 lb
2. 1500 lb
3. 2000 lb
4. 2500 lb

2-36. Parachute harness hardware can be made of which of the following metals?
1. Cadmium plated steel
2. Chrome plated steel
3. Both 1 and 2 above
4. Copper-clad steel

2-37. How many types of adapters are used with parachutes?
1. One
2. Two
3. Three
4. Four

Questions 2-38 and 2-39 are to be judged True or False.

2-38. The several types of snaps used with parachutes include the plain-harness snap, quick-fit snap, and the quick-connector snap.

2-39. A PR must not only know and observe the rules for handling parachutes, but he must be prepared to instruct squadron personnel in the specific DO's and DON'Ts of handling them.

2-40. What type of canopy release adapter, if any, is used with the integrated torso suit?
1. Quick-fit adapter
2. Koch release
3. Cap-well release
4. None

2-41. When placing an RFI parachute assembly into a shipping container, which of the following procedures should you perform?
1. Open the slide fasteners and release the snap fasteners
2. Disengage one end of the spring opening bands
3. Insert the manual ripcord assembly into a suitable small bag
4. All of the above

2-42. What is the total amount of naphthalene flakes that should be sprinkled throughout the parachute assembly prior to sealing it into a shipping container?
1. 1/4 lb
2. 3/8 lb
3. 1/2 lb
4. 5/8 lb

Assignment 3

Personnel Parachute Inspections
Automatic Opening Devices

Text: Pages 3-1 through 3-19 and 4-1 through 4-17

Learning Objective: Recognize types of and criteria for parachute inspections; identify parachute assemblies to be inspected, who inspects them, and how inspections are performed. Identify forms, symbols, and procedures used in inspecting parachute assemblies.

3-1. How often is a special inspection performed on a parachute installed in an A-7 aircraft?
1. Every 7 days
2. Every 10 days
3. Every 14 days
4. Every 60 days

3-2. Periodic maintenance for parachutes falls under the direction and control of the
1. shop supervisor
2. quality assurance officer
3. maintenance control officer
4. maintenance officer

3-3. What manual gives you the drawing number for a drawing that relates to parachute construction?
1. NAVAIR 13-1-6.2
2. NAVAIR 13-1-6.3
3. NAVAIR 13-1-6.2.1
4. NAVAIR 13-1-6.3.1

● Question 3-4 is to be judged True or False.

3-4. Mission, time, equipment, trained personnel, and operational needs are basic considerations involved in determining which level of maintenance shall be used to perform maintenance on a parachute.

3-5. Where do you record a 7-day or 14-day inspection performed on a parachute?
1. OPNAV Form 4790/38
2. OPNAV Form 4790/101
3. NAVAIR Form 1348
4. NAVAIR Form 1030

3-6. How many pages make up a Parachute Configuration, Inspection and History Record?
1. One
2. Two
3. Three
4. Four

3-7. Who is responsible for initiating the Parachute Configuration and History Record?
1. The manufacturer
2. The squadron PR
3. The AIMD that placed the parachute in service

● Question 3-8 is to be judged True or False.

3-8. A new Parachute Configuration and History Record is made out each time the parachute is repacked.

3-9. Which copy of the Parachute Configuration, Inspection and History Record is filed with the aircraft log book?
1. White copy
2. Pink copy
3. Yellow copy
4. Hard back

3-10. The daily inspection of a parachute installed in an aircraft can be performed by which of the following persons?
1. A delegated plane captain
2. A delegated aircrewman
3. A parachute rigger
4. All of the above

● Questions 3-11 through 3-13 are to be judged True or False.

3-11. Only those personnel who have been checked out by both the AME and PR and determined qualified can perform a daily inspection.

3-12. Only parachutes installed in aircraft are subject to a special (7-day or 14-day) inspection.

3-13. A special inspection must include the harness used for that specific parachute inspected.

3-14. If any damage or contamination is found or suspected while an inspection is being performed, who must the inspecting person notify?
1. Line chief
2. Quality assurance
3. Work center supervisor
4. Maintenance control

3-15. When a parachute rigger is repacking a parachute using Shop Process Cards and comes to a step that is underlined, he must get that step verified by
1. a collateral duty inspector
2. the shop supervisor
3. maintenance control

3-16. Due to a work overload, you find that you cannot get a parachute repacked on schedule. How long can you delay the repack?
1. 7 days
2. 10 days
3. 14 days

● Questions 3-17 and 3-18 are to be judged True or False.

3-17. When shipping a canopy to the NPTR, you must chain the lines.

3-18. A conditional inspection is performed as the result of a condition unrelated to a normal inspection interval.

3-19. Which of the following parts of a parachute is/are required to be sent to the National Parachute Test Range (NPTR) after use in an emergency?
1. Pilot parachute
2. Harness
3. Main canopy
4. All of the above

3-20. The ripcord pull test must have a maximum pull force of
1. 22 lb
2. 25 lb
3. 27 lb
4. 50 lb

3-21. A ripcord using a metal retaining clip must have a pull test on the release of the ripcord handle from the clip. That pull must NOT exceed what force?
1. 20 lb
2. 22 lb
3. 27 lb
4. 30 lb

3-22. What do you use to adjust the clip to meet the pull-test requirements?
1. Pliers
2. A screwdriver
3. A ball-peen hammer

3-23. If a parachute pilot chute becomes over-aged 30 days before the next inspection cycle, what action must be taken?
1. The parachute must be repacked early
2. The parachute remains in service until next repack cycle
3. The parachute is taken out of service

3-24. What happens if a cartridge becomes over-aged prior to the next scheduled inspection?
1. The cartridge is taken out of service prior to repack
2. The life may be extended to govern the inspection cycle
3. The parachute is repacked on the date the cartridge expires

3-25. If an emergency-use canopy fails to show a start-of-service date, what will be the service life of the canopy from the date of manufacture?
1. 7 yr
2. 10 yr
3. 12 yr
4. 15 yr

3-26. For information concerning cartridges, you should refer to which manual?
1. NAVAIR 13-1-6.1
2. NAVAIR 13-1-6.4
3. NAVAIR 11-100-1
4. OPNAV 4700.2

3-27. When you test for acid and/or alkaline contamination, what is the safe zone on pH test paper?
1. 0 to 5
2. 5 to 9
3. 9 to 15
4. 15 to 20

3-28. What reading shows acid contamination?
1. 0 to 4
2. 5 to 9
3. 10 to 15
4. 16 to 20

3-29. What is the full range of pH test paper?
1. 0.0 to 14.0
2. 0.0 to 10.0
3. 0.0 to 9.0
4. 0.0 to 8.5

● Question 3-30 is to be judged True or False.

3-30. When testing with pH test paper, you must use distilled water.

3-31. When inspecting suspension lines during an Original Issue Inspection, how much tension must you apply to the lines?

1. 5 lb
2. 10 lb
3. 15 lb
4. 20 lb

3-32. While inspecting parachute suspension lines for proper length, you find that half of the lines are 23' 10" and the other half are 23' 9". What action, if any, must you take?

1. Return lines to supply
2. Adjust all lines to measure 23' 9 1/2"
3. Return to manufacturer
4. None; all lines are within tolerance

3-33. If any work such as removal, replacement, or adjustment is required while inspecting a ballistic spreading gun, you must refer to what manual for information on how to accomplish the work?

1. NAVAIR 13-1-6.1
2. NAVAIR 13-1-6.2
3. NAVAIR 13-1-6.3
4. NAVAIR 13-1-6.4

3-34. When inspecting a parachute harness, you see a stencil on the horizontal backstrap that reads R-2-82. What does this information indicate?

1. The harness was to be removed from service in February 1982
2. The harness was reworked February 1982
3. The harness is a regular size manufactured February 1982
4. The harness is a replacement harness, replaced in February 1982

3-35. If fewer than three stitches are broken or loose on a harness assembly, what action, if any, should you take?

1. Repair it using 6 cord
2. Repair it using 3 cord
3. Repair it with FF
4. None

3-36. How many stitches per inch are used to sew a harness?

1. 12 to 14
2. 10 to 12
3. 6 to 8
4. 4 to 6

3-37. What method is used to remove sand or dirt from canopy quick-release fittings?

1. High-pressure air (1500-1800 psi)
2. Low-pressure air (50 psi)
3. Toluene
4. Dry cleaning solvent

3-38. From the date of manufacture, what is the service life for Type I rubber bands?

1. 1 yr
2. 2 yr
3. 3 yr
4. 4 yr

3-39. From the date of manufacture, what is the service life for Type II rubber bands?

1. 1 yr
2. 5 yr
3. 3 yr
4. 4 yr

3-40. On most parachute containers using rubber bands to hold the suspension lines, the rubber bands must be replaced every

1. repack
2. other repack
3. third repack
4. fourth repack

Learning Objective: Recognize design requirements and component functions of the Model 7000 automatic parachute actuator, and identify procedures pertinent to maintaining, inspecting, arming, and disarming it, including safety precautions to be observed.

3-41. Working with an automatic actuator is the same as working with a loaded

1. .22 caliber pistol
2. .38 caliber pistol
3. .45 caliber pistol
4. shotgun

3-42. The receiver and barrel assembly and the cover and power cable assembly of a 14,000-foot actuator are identified by what color labels?

1. White
2. Green
3. Red
4. Black

3-43. Automatic actuators that are preset to 10,000 ± 1000 feet are identified by what color labels?

1. White
2. Green
3. Black
4. Blue

3-44. The firing mechanism is locked while it is installed in a parachute by which of the following actuator parts?

1. The arming pin
2. The sear
3. The aneroid mechanism
4. The locking pin

3-45. The firing mechanism is prevented from firing before the preset altitude has been reached by which component(s) of the actuator?
1. The actuator stop
2. The gear assembly lock
3. The firing safety lock
4. The aneroid and sear mechanism

3-46. What action results from the forward movement of the piston and its attached power cable?
1. The main powder charge in the cartridge explodes
2. The arming cable is pulled below the preset altitude
3. The aneroid sear releases the firing mechanism
4. The locking pins are pulled and the parachute opening sequence begins

3-47. As the piston is forced forward in the barrel, the power cable travels how many inches?
1. 2.5
2. 3
3. 3.75
4. 4

3-48. If any type of defect is found while inspecting an actuator, what action should you take?
1. Salvage any workable parts from the assembly
2. Affix a tag to the assembly denoting "NOT FOR USE"
3. Remove and scrap the entire assembly
4. Return the assembly to its manufacturer

3-49. You can find information concerning automatic actuators in which of the following manuals?
1. NAVAIR 13-1-6.1
2. NAVAIR 13-1-6.2
3. NAVAIR 13-1-6.3
4. NAVAIR 13-1-6.4

Question 3-50 is to be judged True or False.

3-50. All cover and power cable housings have a serial number. If you find that a serial number for the cover housing has the same number as the power cable housing, you should report this finding on an Unsatisfactory Material Condition Report.

3-51. When inspecting the leaf springs and you find that the tamper dot on the retaining screw is missing, you must torque the screw to a value of
1. 10 to 12 inch-pounds
2. 12 to 14 inch-pounds
3. 14 1/2 to 15 1/2 inch-pounds
4. 15 to 16 inch-pounds

3-52. When you inspect the gasket seal, position should you ensur
facing?
1. The piston
2. Away from the
3. Convex
4. Concave

3-53. The Automatic
has a test c
pressure eq
1. 25,000 f
2. 30,000 ft
3. 40,000 ft
4. 50,000 ft

3-54. Before using the testing ensure that the altimeter pressure reading is
1. 29.29 in.
2. 29.87 in.
3. 29.90 in.
4. 29.92 in.

3-55. To test the firing of the automatic actuator, you must use a dummy cartridge; failure to use this cartridge may result in damage to the
1. firing pin
2. fire wall
3. arming pin
4. gasket seal

3-56. If you were going to test an acutator that is set to fire at 14,000 ± 1000 feet, you would run the test chamber to what altitude?
1. 15,000 ft
2. 16,000 ft
3. 18,000 ft
4. 25,000 ft

3-57. By using the descent toggle, the test chamber will simulate a descent of how many feet per minute?
1. 100 to 150
2. 150 to 200
3. 175 to 200
4. 200 to 250

3-58. When you test the 7000 actuator, how many firing checks are made?
1. One
2. Two
3. Three
4. Four

Learning Objective: Recognize design requirements and component functions of the ballistic spreading gun and identify procedures pertinent to maintaining, inspecting, and changing the cartridges.

3-59. The spreading gun consists of how many slugs, pistons and retainers?
1. 7
2. 14
3. 21
4. 28

3-60. How do you install a cartridge in a spreader gun?
1. Screw it into the breech
2. Load it into a barrel assembly
3. Load it into a piston
4. Thread it into a piston

3-61. What prevents accidental firing of the cartridge during handling?
1. A safety lanyard
2. A safety cable
3. A safety pin
4. A safety lock

3-62. What holds the two lines and loop in the channels of each slug?
1. A rubber band
2. A safety tie
3. A cover plate
4. A rock washer

3-63. As the cartridge fires, the slugs are propelled outward how many degrees?
1. 45
2. 90
3. 180
4. 360

3-64. At a high-speed ejection, the spreading action of the slugs forms what size diameter mouth at the skirt hem?
1. 10 ft
2. 8 ft
3. 6 ft
4. 4 ft

3-65. At a low-speed ejection, the spreading action of the slugs forms what size diameter mouth at the skirt hem?
1. 10 ft
2. 8 ft
3. 6 ft
4. 4 ft

3-66. After the firing pen is withdrawn, the firing lanyard exerts how many pounds of tension on the failsafe assembly sleeve?
1. 15 to 24 lb
2. 24 to 35 lb
3. 10 to 25 lb
4. 30 to 45 lb

3-67. The cartridge used in the ballistic spreading gun has a service life of
1. 5 yr
2. 2 yr
3. 3 yr
4. 4 yr

3-68. After the cartridge has been removed from its sealed metal container, it has an installed life of
1. 18 mo
2. 24 mo
3. 30 mo
4. 48 mo

3-69. You can find safety precautions dealing with the ballistic spreading gun in what manual?
1. NAVAIR 11-100-1.1
2. NAVWEPS 12-100-1
3. NAVAIR 13-100-1.1
4. NAVAIR 12-100-1.1

3-70. When checking for excessive gaps between adjacent canopy slugs, you should use what size feeler gauge?
1. 0.025 in.
2. 0.032 in.
3. 0.050 in.
4. 0.090 in.

3-71. In order to properly check the gap, the feeler gauge should be how many inches long?
1. 1.0
2. 1.5
3. 2.0
4. 2.5

3-72. To repair an excessively gapped slug, what should you do?
1. Use ordnance tape
2. Use masking tape
3. Replace the slug
4. Replace the slug plate

3-73. When you apply ordnance tape to the slugs, what is the maximum number of layers that can be applied to any one slug?
1. One
2. Two
3. Three
4. Four

3-74. When positioning the swivel bolt into the horizontal slot in the clamp, you should tighten the swivel bolt to how many foot-pounds?

1. 5 ± 1
2. 6 ± 1/2
3. 7 ± 1/2
4. 9 ± 1

3-75. When the CDI checks the firing pin release, the pull force must be between

1. 10 to 15 lb
2. 15 to 20 lb
3. 25 to 38 lb
4. 30 to 40 lb

Assignment 4

Conventional Back Personnel Parachute (NB-8)
NES-12 Personnel Parachute System

Text: Pages 5-1 through 5-16 and 6-1 through 6-16

Learning Objective: Recognize uses of and rigging procedures for the NB-8 parachute assembly, including suspension line arrangement, component attachments, and tacking techniques.

4-1. What type of a parachute is the NB-8?
1. Back
2. Chest
3. Seat

4-2. The main canopy on an NB-8 parachute has how many gores?
1. 22
2. 26
3. 28
4. 32

4-3. The NB-8 parachute has how many spring opening bands?
1. Ten
2. Eight
3. Six
4. Four

4-4. When making the tackings on the keeper strap you should use
1. One-turn single 6 cord
2. One-turn double 6 cord
3. Two-turn single 3 cord
4. Two-turn double 3 cord

4-5. To secure the shoulder tabs to the web loops on the NB-8 parachute you should use (a) what length of cord and (b) which knot(s)?
1. (a) 10 in. (b) square knot only
2. (a) 12 in. (b) surgeons knot only
3. (a) 9 in. (b) surgeons and square knot

4-6. What is the length of the ripcord housing for the NB-8?
1. 14 ± 1/2 in.
2. 16 ± 1/2 in.
3. 21 ± 1/64 in.
4. 22 ± 1 in.

4-7. When stowing the suspension lines into the hesitator loops of the NB-8, your first bight should be about how far from the connector links?
1. 18 ± 3 in.
2. 21 ± 3 in.
3. 22 ± 3 in.
4. 24 in.

4-8. After you stow a bight of suspension lines into the hesitator loop, how many inches should extend beyond the hesitator loop?
1. 3/8 in.
2. 1/2 in.
3. 3/4 in.
4. 1 in.

4-9. After you make the last fold of the canopy, how much canopy should be left?
1. 4 in.
2. 6 in.
3. 9 in.
4. 12 in.

4-10. After the last hesitator loop is stowed, how much line is left between the skirt hem and the last loop?
1. 16 to 18 in.
2. 18 to 24 in.
3. 24 to 26 in.
4. 26 to 36 in.

4-11. When making your folds of the canopy onto the container, how far beyond the edge of the container should you extend them?
1. 1 in.
2. 2 in.
3. 3 in.
4. 4 in.

Learning Objective: Recognize component functions and operating characteristics of the NES-12 personnel parachute.

4-12. When ejection occurs, what causes the external pilot parachute on the NES-12 parachute to open?

1. The spreading gun
2. A static line
3. The automatic actuator
4. The external pilot parachute release assembly

4-13. At speeds up to 90 knots, the trimode pilot chute does which of the following?

1. Inflates fully
2. Reduces to 18 inches
3. Reduces to 24 inches

4-14. At speeds between 90 and 250 knots, the trimode pilot chute does which of the following?

1. It reduces in size by 18 inches
2. It reduces in size by 24 inches
3. It reduces in size by 30 inches
4. It inverts

4-15. The suspension lines are pulled from the container by which of the following parachute components?

1. External pilot chute
2. Spreading gun
3. Internal pilot chute
4. Main canopy

4-16. If the spreading gun fails to fire, what permits the canopy to open?

1. The slugs separate from the gun at full suspension line stretch
2. The slugs have breakaway cover plates
3. The override disconnect releases the slugs

Question 4-17 is to be judged True or False.

4-17. When you are reading the rigging and packing procedures and come to a step that is underlined, this means "stop work; it is a CDI point."

4-18. The NES-12 personnel parachute is used with what size canopy?

1. 26-foot
2. 26-foot modified
3. 28-foot modified
4. 32-foot

4-19. The NES-12 personnel parachute uses which of the following types of external pilot chute?

1. Vane
2. Spring
3. Spider
4. Trimode

4-20. The shoulder restraint straps for the NES-12 are located on which of the following parachute assemblies?

1. Riser assembly
2. Container assembly
3. Harness assembly

Learning Objective: Identify procedures for inspecting, rigging and packing the NES-12 parachute assembly.

4-21. To obtain a complete NES-12 parachute assembly to place into service, what must you do?

1. Order each component separately
2. Order a complete NES-12 assembly
3. First order a canopy; then use spare parts to assemble a complete NES-12

4-22. If you are in the process of repacking a parachute and it is time to secure, what action must you take to complete the repacking of the parachute?

1. You must complete the repack before you secure
2. Secure and restart the repacking the next day from step one
3. Either 1 or 2 above, depending upon the circumstances
4. Lay a covering over the canopy and secure

4-23. To attach the internal pilot chute to the NES-12, what type of knot(s) is used?

1. Larks head
2. Bowlin
3. Square
4. Overhand and a clove hitch

4-24. To position the spreading gun for installation into a parachute canopy, it is positioned between which of the following suspension lines?

1. 1 through 14 and 15 through 28
2. 1 through 28 and 14 through 15
3. 21 through 7 and 28 through 8
4. 7 through 14 and 28 through 21

4-25. To route the retaining cord through the main canopy, what tool, if any, is used?

1. Type I suspension line
2. Type II suspension line
3. Type III suspension line
4. None

4-26. When positioning the spreading gun at the skirt hem, the gun should be rotated so that which labeled slug is facing up?

1. 28-1
2. 1-28
3. 12-13
4. 14-13

4-27. When securing the suspension lines to the slug plates on a ballistic spreading gun, you should use a torque pressure of how many inch pounds?

1. 5 ± 1/2
2. 6 ± 1/2
3. 7 ± 3/4
4. 10 ± 1

4-28. To push the sear into the barrel of the override disconnect, which, if any, of the following tools is used?

1. A Bodkin
2. A screwdriver
3. A temporary locking pin
4. None of the above

4-29. The tacking that holds the override disconnect to the pilot parachute connector strap is tacked how far above the knot securing the connector strap to the vent lines?

1. 5 ± 1/2 inches
2. 2 ± 1 inches
3. 3 ± 1/4 inches
4. 4 ± 1 inches

4-30. What type thread/cord is used to make this tacking?

1. E thread
2. FF thread
3. 3-cord
4. 6-cord

4-31. To stow the firing lanyard into the stowage sleeve, which of the following tools is/are used?

1. Type III nylon line and a bodkin
2. A packing hook
3. Type I nylon line and a bodkin
4. Rubber bands

4-32. How many retaining bands are used on the NES-12 container?

1. 8
2. 16
3. 24
4. 36

4-33. To secure the retaining band to the retaining loop on the NES-12 container, what type knot is used?

1. Square knot
2. Overhand knot
3. Half-hitch
4. Lark's head knot

4-34. The breakcords used to secure the lift web protector flaps over the risers are constructed from

1. three-strand cord
2. six-strand cord
3. FF thread
4. E thread

4-35. The knots used to secure the breakcords are

1. lark's head
2. two half-hitches
3. two half-hitches and a clove-hitch
4. surgeon's knot and a square knot

4-36. The connector link ties are constructed from (a) how many lengths and (b) what type cord?

1. (a) Two 12-inch (b) Type I cord
2. (a) Two 16-inch (b) Type I cord
3. (a) Two 24-inch (b) Type I cord
4. (a) Two 16-inch (b) Type III cord

4-37. The loop used in the connector link ties is tied with a/an

1. overhand knot
2. fisherman's knot
3. bowlin and overhand knot
4. fisherman's and overhand knot

4-38. When you install the release lanyard and ripcord assembly, the base plate clamp is positioned before you install the locking pin

1. over the hex nut
2. under the hex nut
3. to the right of the hex nut
4. to the left of the hex nut

4-39. When routing the firing lanyard through the lanyard guide grommet, where is the mark on the lanyard placed?

1. Under the bar on the connector link
2. Over the bar on the connector link
3. Under the cross-connector strap
4. Over the cross-connector strap

4-40. When routing the firing lanyard through the suspension lines, it is routed between lines

1. 1 and 28
2. 14 and 15
3. 7 and 8
4. 16 and 15

Assignment 5

NES-14A Personnel Parachute Assembly
Inflatable Survival Equipment

Text: Pages 7-1 through 7-22 and 8-15 through 8-29

Learning Objective: Recognize procedures for rigging and packing the NES-14A personnel parachute assemblies.

- Question 5-1 is to be judged True or False.

5-1. The anti-squid lines prevent squidding of the canopy by bearing the load of the drogue parachute until the main canopy is fully opened.

5-2. The canopy used with the NES-14A parachute assembly has how many gores?
1. 24
2. 26
3. 28
4. 32

5-3. The NES-14A parachute uses what type of harness?
1. Quick fit
2. Integrated torso
3. Coverall
4. High-speed quick fit

5-4. The canopy in the NES-14A personnel parachute is packed in
1. cloth
2. a hard shell
3. a soft shell
4. a vacuum sealed container

5-5. When you are checking the connector links on the NES-14A parachute, which of the following statements is correct?
1. The knurled portion of the yoke and face plate face down
2. The screwheads face inboard
3. The knurled portion of the yoke and plate face up with the screwhead inboard
4. The knurled portion of the yoke and plate face up with the screwhead outboard

5-6. When laying out the anti-squid lines, where do you position (a) the large loops and (b) the small loops?
1. (a) Skirt hem (b) connector link
2. (a) Skirt hem (b) canopy peak
3. (a) Connector link (b) vent hem

5-7. When you check the continuity of the suspension lines on a NES-14A parachute, which group of lines is on the packer's side of the table?
1. 15 to 28
2. 1 to 15
3. 1 to 14
4. 14 to 28

5-8. Between what lines on the connector links are the anti-squid lines attached?
1. 10, 11 and 14, 15
2. 10, 11 and 18, 19
3. 12, 13 and 20, 21
4. 15, 16 and 17, 18

5-9. When torquing the screws on the connector links, you should use a torque of
1. 15 to 30 inch-pounds
2. 20 to 25 inch-pounds
3. 25 to 40 inch-pounds
4. 40 to 50 inch-pounds

5-10. After you have torqued the screws on the connector links, apply a tamper dot. What should you use to apply this tamper dot?
1. Blue enamel paint
2. Yellow enamel paint
3. Red insignia lacquer paint
4. Black lacquer paint

5-11. How many tackings are placed on the kick plate?
1. One
2. Two
3. Three
4. Four

5-12. When you make the tacking on the kick plate, what type of knot(s) is/are used?
1. Surgeon's knot followed by a square knot
2. Two half hitches
3. Clove's hitch
4. Surgeon's knot followed by an overhand knot

5-13. After you have whipped the canopy, what is the best way to make the skirt hem look neat?
1. Use the suspension lines to pull the skirt hem straight
2. Pull the vent ring tight
3. Align the connector links
4. Align the V-tab reinforcements

5-14. After you have whipped the canopy, what type of a fold is used to pack the NES-14A?
1. S-fold
2. Three-fold
3. Accordion fold
4. Flat fold

5-15. After you connect the withdrawal line to the NES-14A, what must you do?
1. Tack with FF thread, two turns
2. Tack with 3-cord, one turn
3. Tape with electrical tape
4. Tape with glass tape

5-16. When you tape the withdrawal line, you should tape a distance of how far between the lark's head knot and the vent line?
1. 10 in.
2. 8 in.
3. 6 in.
4. 4 in.

5-17. When you prepare tacking cord 'for use, the cord must be dipped in a mixture of what percent (a) paraffin and (b) beeswax?
1. (a) 10 (b) 90
2. (a) 50 (b) 50
3. (a) 60 (b) 40
4. (a) 40 (b) 60

5-18. When tying the connector links together, what do you use?
1. 3-cord, single turn
2. 6-cord, single turn
3. E-thread, double turn
4. FF-thread, single turn

5-19. When you stow the suspension lines into the stowage tray, at what point are the anti-squid lines stowed?
1. 4, 5, or 6
2. 6, 7, or 8
3. 9 or 10
4. 11, 12, or 13

5-20. The amount of suspension line left between the top of the stowage tray and the skirt hem should be how many inches?
1. 8 to 10
2. 10 to 14
3. 12 to 18
4. 18 to 24

5-21. By what method is the stowage tray secured into the container?
1. Rubber bands
2. Type III cord
3. Four screws
4. Type IV nylon tape

5-22. When you stow the canopy, the two S-folds should be how many inches apart?
1. 10
2. 8
3. 6
4. 4

5-23. When you close the container on the NES-14A parachute, where should the withdrawal line on the pilot chute connector strap exit?
1. Aft section on the ripcord side
2. Forward section on the ripcord side
3. Aft section opposite the ripcord
4. Forward section opposite the ripcord

5-24. When you install the kick plate it should be positioned how many inches below the edge of the container?
1. 1
2. 2
3. 3
4. 4

Learning Objective: Identify inspection and test requirements of inflatable equipment, inflation systems and pressures, and maintenance procedures.

Learning Objective: Recognize liferaft construction materials, design features, stowage locations, and configurations, identify inflation procedures; and describe repair requirements for liferafts.

5-25. All inflatable survival equipment shall be subjected to periodic maintenance under the direction of the

1. Maintenance/Material Control Officer
2. Maintenance Chief
3. PR Chief
4. Supply Officer

5-26. To meet unusual situations the calendar inspection maybe extended for any portion up to

1. 5 days
2. 7 days
3. 10 days
4. 14 days

5-27. For aircraft that are in phase maintenance, the time extention for periodic maintenance can be extended to plus or minus what percent of the time cycle?

1. 5
2. 10
3. 15
4. 20

5-28. Liferafts installed in the fuselage require a daily inspection. This inspection may be performed by which of the following persons?

1. The plane captain (designated and instructed)
2. The aircrewman (designated and instructed)
3. The PR
4. All of the above

5-29. Liferafts should have a calendar/phase inspection performed on them each time the aircraft comes in for inspection. This inspection can NOT exceed how many days?

1. 91
2. 180
3. 210
4. 225

5-30. How often is the functional test performed on a liferaft?

1. Every inspection
2. Every other inspection
3. Every third inspection
4. Every fourth inspection

5-31. When you are performing a functional test, the liferaft should inflate to its design shape in less than

1. 1 min
2. 5 min
3. 3 min
4. 4 min

5-32. When applying a pull cable proof load test, you apply a pull force of how many pounds?

1. 25
2. 30
3. 50
4. 75

5-33. Which of the following liferafts can be filled with air by using an oral inflation tube?

1. LR-1
2. LRU-14
3. LRU-15
4. LRU-16

5-34. Before you test the pressure in a flotation compartment for leakage, you have to wait a minimum of how many hours after the final pressure adjustment is made?

1. 8
2. 2
3. 24
4. 4

5-35. To clean a liferaft you use a cleaning compound mixed with water. This mixture should consist of 1-part compound to how many parts water?

1. 5
2. 6
3. 3
4. 4

5-36. How often are CO_2 cylinders for a multi-place liferaft given a hydrostatic test?

1. Yearly
2. Every 2 years
3. Every 3 years
4. Every 5 years

5-37. If you have a CO_2 cylinder installed on a liferaft and it has a hydrostatic date of more than 5 years old and a full charge of CO_2, what action should you take?

1. Remove the cylinder and replace it
2. Empty the cylinder and refill it
3. Repack the liferaft as it will be good until you perform a functional test

5-38. When installing an inflation valve on a CO_2 cylinder to be used on a LRU-15 liferaft, you torque it to how many inch-pounds?
1. 400 ± 40
2. 600 ± 60
3. 800 ± 80
4. 900 ± 100

5-39. CNO has established that liferafts will carry equipment necessary for an aircrewman to survive for a period of
1. 12 hours
2. 24 hours
3. 7 days
4. 14 days

5-40. What is the hydrostatic interval testing, if any, for an LR-1 liferaft cylinder?
1. 10 yr
2. 5 yr
3. 3 yr
4. None

5-41. When repairing a loose or missing seam tape, you must overlap the tape on each end at least how many inches?
1. 1
2. 2
3. 3
4. 4

5-42. What is recommended to remove or loosen damaged tape on a liferaft?
1. Cleaning compound
2. Toluene
3. Gasoline
4. M.E.K.

5-43. How many coats of toluene are applied to an area that you are going to patch?
1. One
2. Two
3. Three
4. Four

5-44. How many coats of cement are applied to the raft when you make a repair?
1. One
2. Two
3. Three
4. Four

5-45. When applying cement to the patch, how long must you wait between the first coat and the last coat?
1. 10 min
2. 15 min
3. 20 min
4. 30 min

5-46. How long must you wait before applying talcum powder to the patch area?
1. 12 hours
2. 24 hours
3. 36 hours
4. 48 hours

5-47. You must scallop the outside area of a patch if the cut is larger than
1. 5 in.
2. 2 in.
3. 3 in.
4. 4 in.

5-48. The dye that is produced from a dye marker ceases to be a good target after
1. 3 minutes
2. 1 hour
3. 1 1/2 hours
4. 2 hours

5-49. A dye-exposed area can be seen from an aircraft flying at 3000 feet for
1. 10 miles
2. 12 miles
3. 25 miles
4. 14 miles

5-50. How much water can a water storage bag hold?
1. 1 qt
2. 2 qt
3. 3 qt
4. 5 qt

5-51. The mirror may be the most important piece of survival equipment carried in a liferaft. On a sunny day it has been seen up to
1. 10 miles
2. 15 miles
3. 20 miles
4. 40 miles

5-52. The survival mirror can produce up to
1. 8 million candlepower
2. 80,000 candlepower
3. 8,000 candlepower
4. 800 candlepower

5-53. The MK 13 MOD 0 distress signal will burn on each end for about
1. 10 sec
2. 15 sec
3. 20 sec
4. 30 sec

5-54. How much water can be purified with one desalting briquet?
1. 8 oz
2. 16 oz
3. 18 oz
4. 32 oz

5-55. How many desalting briquets are supplied with the desalting kit?
1. 3 to 4
2. 4 to 5
3. 5 to 6
4. 7 to 8

5-56. There are two procedures for the desalting kit. In both procedures you are required to shake the container a period of
1. 15 min
2. 30 min
3. 45 min
4. 1 hr

5-57. The MK-80-1 cartridge has a range of how many feet?
1. 500
2. 200
3. 300
4. 400

5-58. Each cartridge flare (MK-80-1) has a minimum duration of how many seconds?
1. 5
2. 6
3. 3 1/2
4. 4 1/2

5-59. How many aircrewman can ride in a LRU-13/A liferaft?
1. 4
2. 7
3. 12
4. 20

5-60. Liferafts that are stowed inboard on aircraft are secured to the aircraft by means of a
1. securing line
2. painter line
3. bolin line
4. shroud line

5-61. A 60-foot cord is used to tie a liferaft to the aircraft and must break away if the aircraft sinks. This line has a static breaking strength of
1. 10 to 20 lb
2. 20 to 50 lb
3. 50 to 100 lb
4. 50 to 150 lb

5-62. How many men can be carried in an LRU-14/A liferaft?
1. 4
2. 7
3. 12
4. 14

5-63. What unique design advantage does the LRU-15/A have over the other liferafts?
1. It carries an outboard motor
2. It can be used as a sailboat
3. It cannot be upside down when inflated
4. It has a puncture-proof flotation tube

5-64. If you are giving a lecture on an LRU-14/A liferaft, you should tell the aircrewmen if they are going to inflate the raft with the hand pump, the first compartment to be inflated is the
1. floor
2. spray tub
3. seat
4. flotation tube

5-65. The interval between a calendar inspection for an LR-1 liferaft should not exceed how many days?
1. 90
2. 180
3. 210
4. 225

Assignment 6

Life Preservers
Oxygen and Related Components

Text: Pages 9-1 through 9-14 and 10-1 through 10-14

Learning Objective: Recognize types, operating principles, design features, and maintenance requirements of life preservers, and identify the components' purposes, capabilities, configurations, and lifesaving applications.

6-1. What is the weight of the LPA-2B life preserver without any survival items?
1. 4.5 lb
2. 2.5 lb
3. 3.0 lb
4. 4.0 lb

6-2. When properly inflated, the LPA-2B life preserver provides the wearer with a buoyancy of
1. 30 lb
2. 60 lb
3. 65 lb
4. 90 lb

6-3. The LPA-2B life preserver has how many flotation chambers?
1. One
2. Two
3. Three
4. Four

6-4. The webbing belt on the LPA-2B life preserver provides adjustment to the wearer. What size range is the belt?
1. 28 to 40 in.
2. 30 to 40 in.
3. 28 to 42 in.
4. 30 to 44 in.

6-5. Which of the following aircrewmen wears the LPA-2B with the FLU-8/P automatic inflation device installed?
1. VF pilot
2. Helo pilot
3. VP crewman

6-6. A passenger flying in a naval transport aircraft is issued which of the following types of life preservers?
1. LPA-2
2. LP2/B
3. LPP-1/1A
4. LPU-3

6-7. What is the weight of an LPP-1/1A life preserver?
1. 1.5 lb
2. 2.5 lb
3. 3.0 lb
4. 4.0 lb

6-8. The LPP-1/1A life preserver provides a minimum of how many pounds of buoyancy to the wearer?
1. 29 lb
2. 35 lb
3. 65 lb
4. 90 lb

6-9. The LPP-1/1A adjusts to fit waist sizes of
1. 28 to 40 in.
2. 28 to 42 in.
3. 30 to 44 in.
4. 30 to 52 in.

6-10. The CO_2 cylinder used with the LPP-1A has a charge of how many grams?
1. 26 to 28
2. 27 to 29
3. 28 to 30
4. 28 to 31

6-11. Who is responsible for performing the preflight inspection on a life preserver?
1. Aircrewman
2. Plane captain
3. PR

6-12. A special inspection is to be performed on life preservers by the organizational level PRs. This inspection must be performed every
1. 10 days
2. 20 days
3. 30 days
4. 60 days

6-13. Passengers who are not carrying any high density items may continue to wear the MK2 life preserver if their total clothing and equipment does not exceed how many pounds?
1. 10
2. 15
3. 20
4. 25

6-14. Calendar/Phase Inspections on the LPA type life preservers that are personnel issued must be performed every
1. 60 days
2. 90 days
3. 180 days
4. 210 days

6-15. Life preservers used in selected air reserve VP squadrons and stowed under controlled conditions must have a calendar/phase inspection every
1. 60 days
2. 90 days
3. 180 days
4. 210 days

6-16. Aircraft-installed life preservers should NOT exceed how many days between calendar inspections?
1. 60 days
2. 90 days
3. 180 days
4. 225 days

6-17. A functional test must be performed on life preservers every
1. 60 days
2. 120 days
3. 225 days
4. fourth inspection

6-18. When performing a functional test on the life preserver it should inflate fully to its design shape in less than how many seconds?
1. 30
2. 45
3. 60
4. 90

6-19. If it is necessary to readjust the pressure in a life preserver when testing it for leaks, you should wait at least how many minutes after the air supply has been shut off before you readjust it?
1. 15 min
2. 10 min
3. 5 min
4. 4 min

6-20. After you have readjusted the pressure, how many hours must you wait before you record it?
1. 1 hr
2. 12 hr
3. 24 hr
4. 4 hr

6-21. After four hours of testing the LPP life preserver, what is the allowable drop in pressure?
1. .20 psig
2. .30 psig
3. .40 psig
4. 1.0 psig

6-22. To perform the visual inspection, you should inflate the LPP life preserver to
1. .50 psig
2. 1.0 psig
3. 1.5 psig
4. 2.0 psig

6-23. When checking the LPU-23/P life preserver, how can you tell if the inflater is spent?
1. It will be loose
2. It will have a hole in the top of it
3. A silver indicator can be seen in the indicator hole

6-24. What is the service life of an FLU-8/P automatic inflator?
1. 1 yr
2. 2 yr
3. 3 yr
4. 5 yr

6-25. The total life of batteries used in the FLU-8/P is how many months?
1. 18
2. 24
3. 36
4. 48

6-26. When you test the batteries for the correct voltage, a fully charged battery will have a reading of how many volts?
1. 3
2. 6
3. 9
4. 12

6-27. Your meter has a reading of -12 volts. What does this tell you?
1. Your batteries are installed backwards
2. You have one dead battery
3. Both batteries are dead
4. Your meter is set too low

6-28. To ensure that the piercing pin moves correctly, how many times should you operate the toggle on the LPA-1/1A?
1. Two or three
2. Three or four
3. Six
4. Ten

6-29. To test the strength of an inflation lanyard, you should apply a test pressure of
1. 25 lb
2. 30 lb
3. 35 lb
4. 50 lb

6-30. When you install a new CO_2 cylinder, it must weigh within how many grams of the stamped minimum weight?
1. 1 g
2. 2 g
3. 3 g
4. 4 g

6-31. When torquing the sensor plug cap on the FLU-8/P you use a force of
1. 8 ± 1 inch-pounds
2. 10 ± 2 inch-pounds
3. 12 ± 2 inch-pounds
4. 16 ± 2 inch-pounds

Learning Objective: Recognize the properties of oxygen, its density and state according to temperature/pressure conditions, and the adverse effects caused by oxygen deficiency.

6-32. At what altitude is it necessary to use a positive pressure breathing regulator?
1. 35,000 ft
2. 40,000 ft
3. 43,000 ft
4. 50,000 ft

6-33. A demand (inhalation) regulator can NOT supply enough oxygen for an aircrewman above how many feet?
1. 32,000
2. 34,000
3. 35,000
4. 43,000

6-34. When the body receives an insufficient amount of oxygen to function properly it is called
1. suffocation
2. asphyxia
3. anoxia
4. hypoxia

6-35. When the body has a complete lack of oxygen it is called
1. anoxia
2. hypoxia
3. asphyxia
4. suffocation

6-36. The atmosphere contains about what percentage of oxygen by volume?
1. 10%
2. 18%
3. 21%
4. 33%

6-37. The atmosphere contains about what percentage of nitrogen by volume?
1. 33 1/3%
2. 58%
3. 68%
4. 78%

6-38. What is the weight of 2 gallons of liqui oxygen?
1. 17.00 lb
2. 19.08 lb
3. 21.00 lb
4. 21.50 lb

6-39. As liquid oxygen turns to gas it has a expansion ratio of
1. 520 to 1
2. 862 to 1
3. 930 to 1
4. 986 to 1

6-40. If you apply 750 psi pressure, oxygen will begin to turn into liquid at what temperature?
1. -147° F
2. -153° F
3. -182° F
4. -279° F

6-41. Oxygen procured by the Navy and tested at 70° F must have a purity of 99.5% and a water content of no more than how many milligrams per liter?
1. 0.01
2. 0.02
3. 0.03
4. 0.04

Learning Objective: Indicate familiarity with the systems and the operation of the 1172AS100 test stand.

6-42. What is used as a pressure source on the 1172AS100 test stand?
1. Oxygen
2. Nitrogen
3. Water-pumped air
4. Ambient air

6-43. What is the maximum altitude of the 1172AS100 test stand?
1. 150,000 ft (45,000 m)
2. 100,000 ft (30,000 m)
3. 75,000 ft (22,500 m)
4. 50,000 ft (15,000 m)

6-44. How many on-off valves are incorporated into this test stand?
1. One
2. Two
3. Three
4. Four

6-45. How many positions are there on the reference pressure selector valve?
1. One
2. Two
3. Three
4. Four

6-46. Inches of water suction can be read by selecting the
1. leakage selector valve
2. pressure selector valve
3. reference pressure selector valve
4. flow selector valve

6-47. What is the principle of operation of a Vol-O-Flo element?
1. Flow restriction
2. Flow pressure
3. Flow suction
4. Flow detection

6-48. Vol-O-Flo elements are installed between certain
1. control valves and their indicating manometers
2. selector valves and their indicating manometers
3. control valves and selector valves
4. on-off valves and control valves

6-49. How many Vol-O-Flo elements are on the 1172AS100 test stand?
1. One
2. Two
3. Three
4. Four

6-50. Which of the following valves allows ambient air pressure into the chamber through the input Vol-O-Flo element?
1. Input valve
2. Output valve
3. Chamber bleed valve
4. System bleed valve

6-51. Which of the following valves has a gage or manometer?
1. Flutter dampener
2. Chamber bleed
3. System bleed
4. Output

6-52. Vent ambient valve (I) is considered an economizer valve because it
1. conserves ambient air
2. is used at sea level
3. saves nitrogen
4. is a nonmeasuring valve

6-53. The shut-off valves must be opened fully, then closed
1. 1/8 turn
2. 1/4 turn
3. 1/2 turn
4. 3/4 turn

6-54. The High Pressure Regulator (Q) is pneumatically operated. It supplies regulated high pressure from
1. 100 psi to the maximum capacity of the supply cylinder
2. 150 psi to the maximum capacity of the supply cylinder
3. 200 psi to the maximum capacity of the supply cylinder
4. 250 psi to the maximum capacity of the supply cylinder

6-55. The Input Pressure Gage has a range from 0 to
1. 160 psi
2. 200 psi
3. 2000 psi
4. 3000 psi

6-56. The Regulated Low Pressure Gage has a range of 0 to
1. 160 psig
2. 200 psig
3. 2000 psig
4. 3000 psig

6-57. The Pressure/Suction manometer (4) has a range of
1. -3.5 to +20.0 in. H_2O
2. -5.5 to +20.0 in. H_2O
3. -9.5 to +28.0 in. H_2O
4. -12.0 to +26.0 in. H_2O

6-58. The Overboard Leakage rotameter (7) has a range of
1. 20 to 200 psig
2. 160 to 300 psig
3. 10 to 100 ccm
4. 20 to 200 ccm

6-59. Which of the following formulas is correct?
1. 10 ccm = 1 LPM
2. 100 ccm = 1 LPM
3. 1000 ccm = 1 LPM
4. 10000 ccm = 1 LPM

6-60. The Overboard Leakage Rotameter should be calibrated at 14.7 psig with an ambient air temperature of

1. 60° F
2. 70° F
3. 75° F
4. 80° F

6-61. The vacuum pump supplied with the 1172AS100 test stand can pump 22.5 cubic feet per minute (0.675 cm^3/min) at an altitude of

1. 43,600 ft
2. 45,600 ft
3. 51,600 ft
4. 54,600 ft

6-62. On the electrical connection plug for the vacuum pump, how many prongs are required?

1. Two only
2. Two or three
3. Three only
4. Four

Learning Objective: Identify the maintenance procedures of the 1172AS100 test stand.

6-63. To fill the output manometer with fluid, you must use a liquid that has a specific gravity of

1. 0.0
2. 1.0
3. 1.5
4. 2.0

6-64. When mixing manometer fluid, you should mix 1 part of Merian D-2930 to how many parts of distilled water?

1. 1
2. 5
3. 10
4. 100

6-65. The Pressure Suction Manometer uses what color of manometer fluid?

1. Red
2. Blue
3. Green
4. Yellow

6-66. What is the gage guard cut-off pressure for the regulated low pressure gage?

1. 100 ± 5 psig
2. 145 ± 5 psig
3. 160 ± 5 psig
4. 180 ± 5 psig

6-67. When performing the altitude chamber and suit simulator tank inward leakage test, you must ascend to 52,000 feet and stabilize for 2 minutes, what is the allowable altitude drop in 20 minutes?

1. 1000 ft
2. 1500 ft
3. 2000 ft
4. 2500 ft

6-68. How often are pressure leakage tests performed on the 1172AS100 test stand?

1. Weekly
2. Biweekly
3. Monthly
4. Every 6 months

Assignment 7

Miniature Oxygen Regulators
Aircraft Panel-Mounted Oxygen Regulators
Liquid Oxygen Converter Test Stands

Text: Pages 11-1 through 11-12, 12-1 through 12-13, and 13-1 through 13-11

Learning Objective: Identify the procedures used for constructing, operating, testing and troubleshooting the 226-20004 miniature regulator.

7-1. The 226-20004 miniature regulator (Mini Reg) has a safety-pressure of how many inches of water above the surrounding air pressure?
1. 0.5 to 1.0
2. 0.65 to 2.0
3. 0.5 to 1.0
4. 0.55 to 2.0

● Question 7-2 is to be judged True or False.

7-2. Inches of water is a means of measuring the comparatively low pressure used in testing oxygen regulators.

7-3. Safety pressure is maintained by the 226-20004 Mini Reg up to and including what altitude?
1. 25,000 ft
2. 32,000 ft
3. 34,000 ft
4. 43,000 ft

7-4. The 226-20004 Mini Reg has a pressure breathing fixture that will maintain a pressure of up to 18.0 inches of water between what altitudes?
1. 0 to 50000 ft
2. 23000 to 34000 ft
3. 34000 to 50000 ft
4. 35000 to 50000 ft

7-5. The 226-20004 Mini Reg operates on what inlet pressure?
1. 40 to 90 psi
2. 30 to 60 psi
3. 60 to 120 psi
4. 1800 to 2000 psi

7-6. Pressure breathing capabilities are provided by which of the following regulator parts?
1. Aneroid only
2. Aneroid seat
3. Aneroid bleed and sensing diaphragm
4. All of the above

7-7. The relief valve serves as a maximum pressure control device. It must maintain pressure at the regulator outlet of how many inches of H_2O?
1. 14.0 to 18.0
2. 14.0 to 16.0
3. 18.0 to 20.0
4. 18.0 to 24.0

7-8. The 226-20004 Mini Reg is considered beyond economical repair when repair parts exceed what percent of the regulator cost?
1. 25%
2. 50%
3. 75%
4. 80%

● Question 7-9 is to be judged True or False.

7-9. There is no depot level maintenance authorized for the 226-20004 Mini Reg.

7-10. What is the service life of a Mini Reg?
1. 5 years from the date placed in service
2. 7 years from the date placed in service
3. 10 years from the date of manufacture
4. As long as it functions properly

7-11. How often should silicone rubber parts be replaced?
1. Each bench test
2. Every other bench test
3. Every 8 months
4. Each time the regulator is disassembled

7-12. How often is the special inspection performed on a 226-20004 Mini Reg?
1. Every 30 days
2. Every 60 days
3. Every 91 days
4. Every 180 days

7-13. How often is the calendar inspection performed on the 226-20004 Mini Reg?
1. Every 30 days
2. Every 60 days
3. Every 91 days
4. Every 180 days

7-14. While inspecting the 226-20004 Mini Reg, you find that the Glyptal paint is missing. What is your next action?
1. Replace the screws
2. Torque the screws to 5 inch-pounds
3. Torque the screws to 10 inch-pounds
4. Remove the screws and apply sealing compound to the thread portion of the screw

7-15. Glyptal paint is used on the head of the screws to
1. insure that sealing compound has been applied to the screws
2. prevent the screws from coming loose
3. insure that the inlet port has been tested
4. insure the screw has been torqued

7-16. Which of the following test stands are used to test the 226-20004 Mini Reg?
1. OTS 583
2. OTS 538
3. 1172AS100
4. 263A590

7-17. When performing the Body Leakage Test, what reading should you have on the Regulated Low Pressure Gage?
1. 60 psi
2. 70 psi
3. 90 psi
4. 100 psi

7-18. When you test for body leakage, what amount of H_2O pressure will be applied to the regulator outlet?
1. 5 in.
2. 10 in.
3. 12 in.
4. 18 in.

7-19. Safety pressure for the 226-20004 Mini Reg can be read on the Pressure/Suction manometer. When the test stand is properly set up for this test it should read between
1. 0.65 and 2.0 in. H_2O
2. 0.50 and 2.50 in. H_2O
3. 1.0 and 2.0 in. H_2O
4. 1.0 and 4.0 in. H_2O

Learning Objective: Identify the tests that are performed on aircraft-mounted oxygen regulators.

7-20. The MD-1 oxygen regulator has a switch that has three (3) settings. Which of the following settings is NOT found on the regulator?
1. Emergency
2. 100%
3. Normal
4. Test mask

7-21. The low-pressure regulator (MD-1) has an operating pressure range of
1. 50- 200 psig
2. 50- 400 psig
3. 50- 500 psig
4. 50-1800 psig

7-22. When you are working on a regulator that needs excessive repair, the regulator shall be considered beyond economical repair when the repair cost reaches what percentage of the cost of the regulator?
1. 25%
2. 50%
3. 75%
4. 90%

7-23. When testing an MD-2 oxygen regulator, you find that the regulator has a discrepancy. Whom do you notify?
1. Oxygen Shop supervisor
2. Parachute Loft supervisor
3. Maintenance Control
4. Material Control (Supply)

7-24. Which of the following maintenance activities possesses the repair capabilities for the MD-2 oxygen regulator?
1. Organizational only
2. Intermediate only
3. Depot only
4. Intermediate and depot

7-25. Who has the responsibility to perform a functional inspection test on an MD-2 oxygen regulator during an acceptance inspection?

1. PR
2. AME
3. Plane captain
4. Quality control

7-26. In order to receive oxygen at sea level during a functional test on the MD-2 regulator, the selector lever must be placed in what position?

1. Normal
2. Emergency
3. Test mask

7-27. When you perform the functional test on the MD-2 oxygen regulator, proper operation is indicated by observing the

1. regulator outlet
2. high-pressure gage
3. low-pressure gage
4. flow indicator

7-28. The MD-2 oxygen regulator must be inspected in accordance with the planned maintenance system (PMS). This inspection can NOT exceed how many days?

1. 20
2. 60
3. 180
4. 225

7-29. How often should the silicone rubber parts be replaced on the MD-1 oxygen regulator?

1. Every 60 days
2. Every 91 days
3. Every 225 days
4. Each time the regulator is disassembled

7-30. Which of the following oxygen test stands is used to bench test the MD-2 oxygen regulator?

1. OTS 565
2. OTS 566
3. 1172AS100
4. 29A762

7-31. Nitrogen supply cylinders used in testing oxygen regulators must be 80 cubic feet and contain a maximum pressure of

1. 2500 ± 200 psig
2. 2000 ± 200 psig
3. 1800 ± 200 psig
4. 1800 ± 100 psig

7-32. The maximum allowable leakage for the inward leakage test on the MD-1 oxygen regulator is how many cubic centimeters per minute?

1. 100
2. 200
3. 300
4. 400

7-33. To perform the outlet leakage test, you apply a film of leak detection over the regulator outlet. The film shall advance no more than

1. 1/4 inch in 5 sec
2. 1/2 inch in 5 sec
3. 1/4 inch in 10 sec
4. 1/2 inch in 10 sec

7-34. What is the allowable leakage for the overall leakage test?

1. 60 psig in 2 min
2. 40 psig in 2 min
3. 30 psig in 2 min
4. 10 psig in 2 min

7-35. When you perform the outward leakage test on the MD-1 regulator, what is the allowable leakage?

1. 0.01 LPM or 5 CCM
2. 0.05 LPM or 50 CCM
3. 0.10 LPM or 100 CCM
4. 0.12 LPM or 120 CCM

7-36. When you test the Second Stage Relief valve with 3" of mercury applied to the regulator outlet, the valve should be venting at how many LPM?

1. 10
2. 20
3. 45
4. 120

7-37. When you perform the Flow Suction Test the maximum flow through the regulator with no suction applied is how many LPM?

1. 0.01 LPM
2. 0.02 LPM
3. 0.05 LPM
4. 0.10 LPM

7-38. When you are performing an aneroid closure test, the aneroid should close between

1. 23000 and 25000 ft
2. 27500 and 30000 ft
3. 28000 and 32000 ft
4. 32000 and 43000 ft

Learning Objective: Identify the operating characteristics and maintenance requirements of the 59A120 liquid oxygen converter test stand.

7-39. Testing liquid oxygen (LOX) converters is the responsibility of which of the following personnel?

1. PR
2. AME
3. Depot maintenance

7-40. To test a LOX converter you should use which of the following test stands?
1. OTS 565
2. LQTS 565
3. 59A120
4. 62A

7-41. When operating properly, the relief valve on the bell jar has a range of
1. 3 to 5 psig
2. 5 to 15 psig
3. 10 to 15 psig
4. 15 to 30 psig

7-42. The relief valve on the bell jar is leak tight at what psi?
1. 5
2. 2
3. 3
4. 4

7-43. At what pressure does the relief valve on the bell jar start to relieve?
1. 5 psig
2. 10 psig
3. 15 psig
4. 20 psig

7-44. The converter section of the test stand is protected by a relief valve (RV11). This valve is set to relieve pressure at
1. 15 psig
2. 50 psig
3. 100 psig
4. 110 psig

7-45. The differential pressure gage (DF-1) has a range of
1. -10 to +50 in. H_2O
2. -50 to +100 in. H_2O
3. 0 to 100 in. H_2O
4. 0 to 150 in. H_2O

7-46. How many linear flow elements are on each 59A120 test stand?
1. Six
2. Two
3. Seven
4. Four

7-47. The supply pressure gage (PG3) has a range of 0 to
1. 300 psi
2. 1800 psi
3. 2000 psi
4. 3000 psi

7-48. The adjustable regulator is preset to deliver how much pressure to the test stand through supply valve V-6?
1. 60 psig
2. 90 psig
3. 120 psig
4. 160 psig

7-49. Which of the following pressure gages (PG) indicates the pressure applied to the item under test?
1. PG 1
2. PG 2
3. PG 3
4. PG 4

7-50. Relief valve V-4 prevents excessive pressure buildup in the test stand. The valve is leak tight at what pressure?
1. 90 psig
2. 120 psig
3. 140 psig
4. 160 psig

7-51. Relief valve V-4 prevents excessive pressure buildup in the test stand. The valve is set to relieve at what pressure?
1. 90 psig
2. 100 psig
3. 160 psig
4. 180 psig

7-52. How many graphs are supplied for each test stand?
1. One
2. Two
3. Three
4. Four

7-53. When you set the oxygen pressure regulator, a minimum of how much pressure should be applied to the regulator?
1. 300 psig
2. 1000 psig
3. 1800 psig
4. 2000 psig

7-54. What amount of pressure is set on the pressure regulator (R-1)?
1. 110 psig
2. 160 psig
3. 260 psig
4. 360 psig

7-55. When you test the test stand for overall leakage, the relief valve RV-11 is set to relieve at approximately
1. 15 psig
2. 110 psig
3. 120 psig
4. 160 psig

7-56. When you perform the overall leakage test, any leakage in the system is indicated by a drop in pressure on PG1. The pressure drop should be no more than
1. 5 psig in 5 min
2. 5 psig in 10 min
3. 10 psig in 5 min
4. 10 psig in 10 min

7-57. When you test the bell jar for leakage, the drop in pressure on the differential pressure gage should be no more than

1. 2 in. H_2O in 10 min
2. 2 1/2 in. H_2O in 10 min
3. 3 in. H_2O in 5 min
4. 3 in. H_2O in 10 min

7-58. To clean all the external parts of the test stand, what should you use?

1. Windex
2. Glass Plus
3. A soft lint-free cloth
4. Soap and water

7-59. A monthly leakage inspection of the test stand is performed after how many hours of use?

1. 100
2. 150
3. 250
4. 300

7-60. A weekly leakage inspection is performed on the test stand after how many hours of use?

1. 10
2. 20
3. 40
4. 50

Assignment 8

Liquid Oxygen Converters
Rigid Seat Survival Kit

Text: Pages 14-1 through 14-16 and 15-1 through 15-11

Learning Objective: Relative to the liquid oxygen (LOX) aircraft converter, identify its purpose, construction features, and operating principles, including associated components.

8-1. Liquid Oxygen (LOX) is stored at approximately what temperature?
1. -297°F
2. -282°F
3. -297°C
4. -282°C

8-2. The quantity gage used with the LOX converters indicates the amount of LOX in
1. gallons
2. quarts
3. pints
4. liters

8-3. A LOX converter is considered full when
1. the capacitance probe indicates full
2. the quantity gage indicates full
3. a steady stream of LOX flows from the overboard vent
4. the converter will stop receiving LOX

8-4. At what approximate pressure does the pressure closing valve close?
1. 40 psig
2. 60 psig
3. 75 psig
4. 110 psig

8-5. The relief valve in most LOX systems is set to open at approximately
1. 40 psig
2. 60 psig
3. 75 psig
4. 110 psig

8-6. With a pressure of 100 to 120 psig applied, the relief valve should vent at least
1. 50 LPM
2. 100 LPM
3. 150 LPM
4. 200 LPM

8-7. The converter leakage test is performed with the converter pressurized to
1. 50 psig
2. 95 pisg
3. 100 psig
4. 110 psig

8-8. The time required to fill a 10-liter LOX converter at a filling pressure of 30 psig should not exceed how many minutes?
1. 5
2. 10
3. 15
4. 30

8-9. The LOX converter can maintain a pressure of 55 to 90 psig while delivering a flow of
1. 50 LPM
2. 100 LPM
3. 120 LPM
4. 200 LPM

8-10. To prevent moisture from entering the converter during shipment or storage, the converter should have a gaseous pressure of
1. 14.7 to 15 psig
2. 15 to 25 psig
3. 25 to 30 psig
4. 30 to 40 psig

8-11. The warm-up time for a purging unit should be how many minutes?
1. 5
2. 10
3. 15
4. 20

8-12. When you measure the outlet temperature of a purging unit, the temperature should be between
1. 100°F and 125°F
2. 125°F and 150°F
3. 150°F and 200°F
4. 200°F and 250°F

8-13. What is the purging time for a 10-liter LOX converter?
1. 15 to 30 min
2. 30 to 45 min
3. 45 to 60 min
4. 45 to 75 min

8-14. When you purge a LOX converter, the maximum inlet pressure and temperature should be
1. 60 psig and 250°F
2. 55 psig and 200°F
3. 55 psig and 250°F
4. 45 psig and 150°F

8-15. When you perform the capacitance test on a LOX converter, the reading on the test stand should be between
1. 121.5 to 125.5 (μμF) micro-microfarads
2. 121.5 to 130.0 (μμF) micro-microfarads
3. 100.0 to 150.0 (μμF) micro-microfarads
4. 150.0 to 250.0 (μμF) micro-microfarads

8-16. The relief valve on a LOX converter with a pressure of 120 psig should be relieving at a minimum of
1. 50 LPM
2. 75 LPM
3. 80 LPM
4. 100 LPM

8-17. When you perform the Fill and Buildup Time Test on a converter, the filling pressure must be maintained at
1. 30 psig
2. 50 psig
3. 60 psig
4. 90 psig

8-18. After you have completed the fill test, you must perform a pressure buildup test. What is the required time to buildup a working pressure of 70 to 80 psig?
1. 1 min
2. 5 min
3. 15 min
4. 30 min

8-19. After a period of 24 hours the evaporation loss should NOT exceed how many pounds of LOX when the converter is in the Buildup and Supply mode?
1. 1 lb
2. 2 lb
3. 3 lb
4. 4 lb

8-20. The evaporation loss test in the vented mode cannot lose more than how many pounds in 24 hours?
1. 5 lb
2. 6 lb
3. 3 lb
4. 4 lb

8-21. The opening handle on the RSSK 8 is painted what color?
1. Yellow
2. Black
3. White
4. Red

8-22. Oxygen from the emergency oxygen system is prevented from flowing into the aircraft O_2 system by the
1. aircraft O_2 pressure
2. check valve in O_2 line
3. check valve in O_2 mask
4. poppet valve

8-23. If the automatic actuation lanyard fails to actuate the emergency oxygen system, the pilot can operate it manually by pulling the
1. yellow "D" ring
2. red "D" ring
3. green ring
4. yellow release handle

8-24. Who performs the daily/turnaround inspection?
1. Plane captains (qualified by the Aviators Equipment Branch)
2. PRs
3. AMEs

8-25. When performing a daily inspection, you find that the O_2 system is low in pressure. What action must be taken?
1. Notify the PR shop
2. Notify the AME shop
3. Notify Maintenance Control
4. Recharge the system

8-26. What is the maximum time that can elapse between phase inspections?
1. 90 days
2. 120 days
3. 180 days
4. 225 days

8-27. To perform the swaged ball pull test, the swaged ball should withstand a pull force of how many pounds?
1. 50
2. 100
3. 150
4. 250

8-28. When you perform the swaged ball pull test, ensure that the links and clevis are not pulled from the housing more than
1. 1/2 in.
2. 1 in.
3. 1 1/2 in.
4. 2 in.

8-29. Emergency oxygen cylinder pressures used in functional tests are taken under ideal conditions. What is the ideal temperature in the oxygen shop?
1. 60° F
2. 70° F
3. 75° F
4. 80° F

8-30. To perform a functional check, the seat pan O_2 system should have a pressure reading of how many psig?
1. 1500 to 1650
2. 1650 to 1800
3. 1800 to 1900
4. 1800 to 2000

8-31. When you test the manual emergency oxygen release handle, the disengagement force for the handle should be
1. 3 to 5 pounds
2. 5 to 15 pounds
3. 8 to 25 pounds
4. 10 to 30 pounds

8-32. When you test the relief valve on the RSSK 8 emergency O_2 system, the valve should unseat at a pressure of
1. 40 to 60 psi
2. 70 to 90 psi
3. 90 to 120 psi
4. 120 to 140 psi

8-33. When testing the relief valve it must reset at a minimum of how many psi?
1. 90 psi
2. 100 psi
3. 110 psi
4. 120 psi

8-34. Purging the emergency O_2 system is required when the system
1. falls below 15 psi
2. falls below 5 psi
3. has remained empty for less than 1 hour
4. has remained empty for 2 hours or more

8-35. To purge a system, you should use nitrogen at a temperature of
1. 110° C to 130° C
2. 120° C to 140° C
3. 140° C to 150° C
4. 150° C to 160° C

8-36. When you charge an O_2 system, each filling stage should take at least how many minutes?
1. 2 min
2. 2 1/2 min
3. 3 min
4. 4 min

8-37. A cooling period of how many minutes is required between filling stages?
1. 1 min
2. 2 min
3. 3 min
4. 4 min

8-38. When you ship an O_2 cylinder, a pressure of how many psi should be left in the cylinder?
1. 200 psi
2. 1,000 psi
3. 1,800 psi
4. 2,000 psi

COURSE DISENROLLMENT

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PRINT OR TYPE

Aircrew Survival Equipmentman 3&2, Volume 2
NAVEDTRA 10329

NAME ______________________________ ADDRESS ______________________________
Last First Middle Street/Ship/Unit/Division, etc.

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City or FPO State Zip

RANK/RATE ________ SOC. SEC. NO. ______________________ DESIGNATOR ________ ASSIGNMENT NO. ________

☐ USN ☐ USNR ☐ ACTIVE ☐ INACTIVE OTHER (Specify) ______________ DATE MAILED ________

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PRINT OR TYPE

Aircrew Survival Equipmentman 3&2, Volume 2
NAVEDTRA 10329

NAME ______________________ ADDRESS ______________________
Last First Middle Street/Ship/Unit/Division, etc.

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City or FPO State Zip

RANK/RATE ________ SOC. SEC. NO. ______________ DESIGNATOR ________ ASSIGNMENT NO. ________

☐ USN ☐ USNR ☐ ACTIVE ☐ INACTIVE OTHER (Specify) ______________ DATE MAILED ________

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Aircrew Survival Equipmentman 3&2, Volume 2
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